DIRECTION

THE ESSENTIAL DIMENSION

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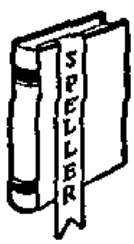
The Essential Dimension

CHARLES W. WILLIAMS



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TO

my darling wife who has
been so patient, and to
those who have been such
a help in clarifying the
concepts through which
these truths have been
substantiated.

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CONTENTS

INTRODUCTION

THE HUMAN MIND, since the world began, has been impelled by a burning desire for freedom. It has felt that if it could somehow just move about a little more, move a little farther or faster, gain greater knowledge of the world and what makes it function, then it would acquire greater freedom. But for some reason it never seems to work out. The more freedom we acquire, the more complicated life becomes.

It may be that the freedom for which we have been striving is not real freedom at all, but just an escape from reality. Maybe we need a new definition and a new approach to freedom; a form of freedom that will help the human mind to develop and progress to a higher order without all the complications and restrictions of modern life. Perhaps we need to turn our minds to a new form of creative thinking that will introduce a new and different form of creative freedom, a form of freedom that has become lost in the complicated world of today.

Man has held assiduously to the theory of the survival of the fittest, in other words, in the survival of those forces working in opposition to each other. Sociologists have recently come forward with the theory that life progresses, not so much through forces working in opposition to each other, but rather through forces which work in cooperation, parallel to each other, in the same direction.

INTRODUCTION

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its *outward sense*, in contrast to the proton, which supplies the *inward sense*

In order to emphasize the importance of these inward and outward senses of direction, we will give them names of their own to distinguish them from the protons and electrons which have come to be recognized as quanta The axis of the proton we will term a "VIBRON," which we will interpret as the inward, centripetal axis of vibration The axis of the electron we will term a "ROTON," interpreted as the outward centrifugal axis of rotation The third axis, the precessed axis about which energy and matter form does not need a name because the name of the form of energy or the element designates that axis Each element and each form of energy has a precessed axis of its own peculiar to that element or form of energy, i e , light, heat, electricity, etc

Every atom, molecule and form of energy from the simplest atom to the force of an atomic explosion possesses three orthogonal [1] axes consisting of an axis of vibration, an axis of rotation, and a precessed [2] axis of translation[3] or stabilization [4]

A few general hypotheses concerning the directions of the axes of energy are presented here

Hypotheses

I Every form of energy must possess three orthogonal axes which serve as senses of direction supplying the necessary dimensionality to energy to enable it to exist and function

[1] Orthogonal—right angles, rectangular Three lines or projections at right angles, perpendicular to each other

[2] Precession—A change in the direction of the axes of a rotating body, as a top or gyroscope, the effect of which is to rotate the axis (axis of spin) perpendicular both to its original direction and the direction of the force or torgue producing the change

[3] Translation—Motion in which all the points of a moving body have at any instant *the same velocity and direction of motion,—in contrast to* or as distinct from rotation

[4] Stabilization—to make stable, steadfast, or firm Durable; not subject to sudden change

Both of these alignments are essential to the development of a higher order of civilization, but there is another alignment which is just as important—the alignment of forces which are at right angles, complementary, to each other Each of these alignments has its proper place in the progress of this world and in the development of the human mind to a higher order They form the basis of all knowledge and understanding from the simple addition and subtraction of arithmetic to the advanced theories of quantum mechanics and field theories

Science tells us that the three primary co-ordinates of existence are time, space and distance These three co-ordinates have been so designated because through their use in mathematical equations, science has been enabled to solve most of the important problems in the creation and generation of energy

One of the greatest revelations in all of these studies is the manner in which the human mind accepts certain postulates as true and infallible even though it does not know how such postulates originally came to be accepted

Science has always been aware of the importance of direction, but has not, so far as we know, recognized the relationship between direction and sense As a result, science has neglected to emphasize the important part which the co ordinate direction plays, not only in formulating its mathematical equations, but in the creation of energy and matter

As we proceed with this study, it will be found that direction is not only the determinant of the sensate qualities of everything that exists including light, heat, gravity and electricity, but that it also has a powerful influence over the more complicated phenomena of life We will find that time and space do not contain the whole of reality, that direction also has a great influence upon every form of energy, every element of matter, every form of life, and that our minds and bodies are dependent for their creation, perpetuation and functioning upon this important co ordinate

The electron is one of the important co ordinates of every form of energy It is the co-ordinate which supplies energy with

RULES FOR DIRECTION

Direction is at the root of all natural phenomena and sensory perception It is by means of direction, the sense of direction and a direction of motion that the human mind is enabled to acquire the sentient qualities necessary for gaining consciousness so that it is able to recognize what takes place in the world

Direction is a coordinate of existence, just as space and time are coordinates Direction is the sensate coordinate in the same manner that distance is a spatial coordinate, and motion a tem poral coordinate Everything must have direction as one of its coordinates in order to exist Without direction there could be no "form" [5]—atomic, molecular or mass, no structure, no sensi tivity, no energy

Direction gives meaning to our mathematical signs and sym bols, and it is through the sense of direction that we are enabled to distinguish these signs and symbols as well as all other sym bols used to designate numbers, the letters of the alphabet, sizes, shapes and forms It is through senses of direction that we are enabled to communicate with one another and express ideas en-abling the human mind to gain in knowledge and understanding and use common sense" (see Chapters I and VIII)

[5] Aristotle considered "form" one of the co-ordinates of existence along with ' time' and "space " He used the term "form" as expressing the essence of a thing

In this study we consider "form" not as a co-ordinate of existence but as a resultant of the co-ordinate "direction," the sensate co-ordinate through which "time" and "space" are made sentient

II. These three orthogonal axes are: (1) An axis of vibration; (2) an axis of rotation; and (3) an axis of translation or stabilization.

III. These axes have no physical attributes. They can move about within the atoms and particles of matter, or in empty space. They can change their position, direction, alignment, or sense at will. They can join together with or separate from other axes of the same nature to bring about the reactions of freezing, melting, vaporizing, etc., depending upon the source of stimulus.

size and weight, each of which is made sentient in the human mind through an angular sense of direction introduced through the eyes, finger tips, or through oral or written symbols.

The spatial qualities of kinetic energy, on the other hand, are made known through the sensate qualities of the position, sense of direction and direction of motion of the co-ordinates and their axes.

When the motions of kinetic energy are a combination of translation and vibration, they are termed wave motions; when they are a combination of translation and rotation, they are termed rays of radiant energy.

The axes about which the properties of space gather are termed "VIBRONS," while the axes which give the co-ordinates their outward senses are termed "ROTONS."

When vibrons acquire properties they take a definite position in space and acquire a sense of direction which may be inward, outward, or both. Wave motion and ray motion can function either inward or outward, but centripetal motion is an inward vibration or wave motion, while centrifugal motion is an outward rotation or ray motion (see Chapter III).

The spatial properties of atoms are made up of particles of matter. With each increase in properties there must be an increase of vibrons about which matter gathers to acquire its spatial form. The ratio of body to vibrons remains fairly constant in each form of energy, but the ratio of rotons to body varies with the consistency, frequency, and direction of motion. As rotons increase or decrease, the rate of acceleration, sense of direction, direction of motion, and at times the position of the rotons and vibrons changes.

RULE IV. Potential energy has very little or no motion, but the axes of the co-ordinates of which all energy is composed give to potential energy its sense of form and consistency.

Kinetic energy, on the other hand, has many directions of motion as well as senses of direction and positions of its vibrons and rotons which determine its characteristics.

The words form, mass, structure, imply senses of direction; substance of three dimensions; an orderly arrangement of parts; the interrelation of parts as dominated by the general structure of the whole.

In like manner, the term energy implies either substance of three dimensions—as potential energy; or motion in which the three directions of motion are involved, each of which functions on an axis which is perpendicular to the other two. It is through these three perpendicular axes of direction that the co-ordinates of existence take form and are made sentient in the human mind (see Chapter II).

RULE I. All energy has three co-ordinates, a spatial, a temporal and a sensate co-ordinate, each of which has an axis through which it acquires a position in space, a direction of motion and a sense of direction. The sensate co-ordinate is the co-ordinate through which nature acquires its sense of form and structure and thus is made sentient.

RULE II. The sensate axis is the primary axis of existence. The motions which this co-ordinate controls are the motions of inward and outward translation.

The spatial axis which functions perpendicularly to the sensate axis is the axis about which the properties of space gather. The motions which this axis controls are the motions of upward and downward vibration.

The third perpendicular axis is the temporal axis. The motions which this axis controls are the motions of clockwise and counter-clockwise rotation.

The directions of motion are:

a. Inward and outward translation (sensate).
b. Upward and downward vibration (spatial).
c. Right and left rotation (temporal).

RULE III. The spatial properties of potential energy are mass,

is capable of developing. Some elements possess only one valence axis (univalents); some possess two axes (bivalents); some possess three axes (trivalents); some go up to as high as twenty four valence axes; while others are incapable of developing even one valence axis until reduced to near absolute zero (monovalents or monatomics).

When the vibrons of an element in its gaseous state are lined up parallel to each other, they precess to the perpendicular of vibration to form molecular axes, serving as the axes of a liquid or crystalline substance. When the axes of the molecules line up parallel to each other and precess to the perpendicular of stabilization, they serve as the axes of metallic substance.

While it is the number of rotons which determine the consistency of substance, it is the direction of the valence axes which brings about the phenomena of freezing, melting, volatilization, etc. They also determine the characteristics of substance, basic (alkaline), acidic (acid forming).

The alignment of the rotons in relation to the vibrons determines the sense of color; while the alignment of the vibrons to each other determines the senses of taste and smell.

RULE IX. The chemical reactions of precipitation, solidification, melting, vaporizing and combustion are brought about through the precessions of the vibrons of elements in relation to each other.

RULE X. When elements whose vibrons are parallel combine, the mass of the element increases in size but no change takes place in the characteristics of the element. This is the basis of growth.

RULE XI. When elements whose vibrons are perpendicular combine, they precess to a third perpendicular to form a new element. This is the basis of creation.

RULE XII. When elements whose vibrons are inverse combine,

RULE V. The motions of translation, vibration and rotation function on axes which are diametrically orthogonal to each other The motion of vibration is an up and down motion about a vibron axis, while rotation is a rotating motion about an axis of rotons which functions perpendicularly to the axis of vibration The motions of inward and outward translation function on axes which are mutually orthogonal to the axes of vibration and the axes of rotation Inward translation, bringing about consolidation, functions on axes whose sense is diametrically opposite to the sense of outward translation

RULE VI Certain senses are created through a sense of position of the axes of the co-ordinates, others through a sense of direction of the axes, while others are created through a direction of motion of one or more of the co-ordinates When the position, sense of direction or direction of motion of one or more of the coordinates changes, the form, consistency or sense of energy changes

RULE VII Chemical, electrical and radio-active energy are each made manifest through the position of the axes of the coordinates in relation to each other

a When the vibrons and rotons are parallel—chemical energy is created, both potential and kinetic

b When vertical—electrical energy

c When latical [6]—radio active energy

RULE VIII Valence axes are made up of vibrons The vibrons of an element assume positions, senses of direction, and directions of motion in relation to each other to bring about changes in the character and reactions of various forms of energy

'Valence" is the number of vibron axes an atom possesses or

[6] 'Latical is a term which has been coined to indicate two directions perpendicular to each other in separate planes, in contrast to 'vertical'—two directions perpendicular in the same plane

direction. Without time there could be no motion, and without motion there could be no time. Likewise without space there could be no matter, and without matter there could be no space. Without direction there could be no order, and without order there could be no constancy in the world (see Chapters VI and VII).

they precess to the perpendicular to establish a new and higher group of elements This is the basis of evolution

RULE XIII The elements of each group develop through the precession of their perpendicular axes from univalents, to bi valents, to tri valents, etc of a basic nature up to and through the multivalents of seven axes and over, then revert back to bi valents and univalents of an acidic nature

RULE XIV The jump from elements in one group to elements of the next higher group in a series is brought about through the joining together of the first and the last elements in a group whose senses are inverse, one basic, the other acidic

RULE XV The phenomena of the creative power of preces sion is of two natures The first is the precession of the rotons in relation to the vibrons to bring about the various forms of chemical, electrical, and radio active energy The second is the precession of the vibrons of one element in relation to the vibrons of another element to bring about the compounds of elements and the creation of higher elements and groups of elements (see Chapter IV)

RULE XVI Life energy was created through the fusion of cer tain elements with the radio active energy of other elements or their isotopes (see Chapter V)

RULE XVII The different species of life were created through the fusion of radio active energy with the elements of different groups, the lower species coming from the lower groups of ele ments the higher species from the higher groups

RULE XVIII Life is recreated in each species through the fusion of complementary, male and female, organisms

RULE XIX The essence of all existence is time, space and

DIRECTION

The Essential Dimension

CHAPTER I

DIRECTION AND SENSE

DURING THE LATTER PART of the 18th Century a Scottish physicist, Alfred Daniell, stated "In the investigation upon which Natural Philosophy is founded, the guiding principle is a belief, based on the recorded experience of the human race, in the "Constancy of the Order of Nature."

This is a very interesting and challenging phrase, "The Constancy of the Order of Nature." What is there about nature, and how is nature enabled to maintain its constancy? This is a study which will require a great deal of research and original thinking because it introduces a new co-ordinate into the time-space manifold about which there are very few direct references, although there is a great deal of material which deals with this subject indirectly. This new co-ordinate is DIRECTION.

Everyone is more or less familiar with the co-ordinates time and space which are referred to almost daily in our newspapers and periodicals, but very seldom do we see any reference to direction as a co-ordinate of existence because we have not been taught to consider direction as a co-ordinate but rather as a line, a position or a motion whose direction is purely incidental.

Before going into the physics of this subject, let us first trace its history to see if we can gain some insight into the reasons why direction has been by-passed and not considered as a co-ordinate along with the other primary co-ordinates, time and space. The earliest means of communication in writing were through the use of hieroglyphics in which the characters were of two main classes; those representing the objects themselves, or

direction of two lines we get the various symbols T V L X +, = Each symbol is made sentient in the human mind by the position and direction of the lines employed

All signs and symbols that are used to convey meanings, derive their meanings in this same manner, through a direction, position, or form given to the lines that make up our signs and symbols

If, on the other hand, we change the sequence of the symbols, as when we write in a foreign language, the letters still symbolize the same sounds but the sounds have no meaning unless we understand the language

The spoken word carries no meaning with it unless the meaning is associated in some way with a sense of direction in the human mind To refute this one might say that a young child, a parrot, or one who had never learned to read or write, does not associate what it says or thinks with any sense of direction, which is quite true, but this does not refute the fact that someone at some time had to associate these various directions, positions and forms of lines with certain sounds and senses of directions in the human mind, in order orginally to convey the desired meanings

The written language of mathematics does not possess an absolutely perfect set of symbols each of which conveys one unequivocal meaning for everyone Different sciences use different symbols for the same thing, while identical symbols may have different meanings for different scientists

The earliest written symbols for numbers were merely groups of strokes

1	II	III	IIII	IIIII	IIIIII
	2	3	4	5	6
IIIIIII	IIIIIIII	IIIIIIIII	IIIIIIIIII		
7	8	9	10		

The Chinese improved and simplified this by changing the position and direction of one of the strokes for the higher numbers

a symbolic idea associated with them: or each character representing an alphabetical sound or a complete syllable. These hieroglyphic characters of the earliest picture writing were gradually reduced to simpler forms which retained only the leading characteristics of the objects symbolized. These were again abbreviated and conventionalized into other systems of writing.

Picture writing, it is plain to see, like drawings or photography, carries its meaning to the mind through lines of directions. Many Chinese characters are good examples of ancient pictures modified by cursive script. The cuneiform system of writing invented by the Sumerians and adopted by many Near East countries likewise originated in pictographs. It is a mixture of ideograms and syllabic signs.

Each letter of our alphabet was derived from ideograms and syllabic signs which, when joined together with other letters, portrays in the mind certain senses which have come to have a standard meaning so that one mind can communicate its meanings to other minds.

Aristotle conceived of the idea that all things partake of both 'matter' and 'form', and that the 'form' may be altered without any fundamental alteration of the 'matter'. He recognized a relationship between form and a sensory perception. We are not aware that it is the form of the mathematical and alphabetical symbols and signs that enables us to translate them into sensory perceptions. We do not stop to consider that it is the direction and form of the lines in symbols and signs that give them their meaning. If we change an F to an, a V ⅎ to a Λ, a T to a ⊥ merely by changing the position or directions of the lines in each symbol, we completely change the meaning of the symbols.

When we use these symbols we do not stop to figure out how they came into being, or how they convey the desired meaning to the mind; we just accept them with no particular thought of how their meaning originally came to be accepted. If we stop to think about it, we realize that just by changing the

Along with these numbers and letters, many other signs and symbols have come into common usage:

(+)	plus, addition			(−)	minus, subtraction		
(×)	multiplication			(÷)	division		
(=)	equals	(°)	degress	(%)	percent	(#)	number

These signs and symbols are marks placed on paper or words expressed by means of letters, but whichever form is used, it acquires its perceptibility through senses of direction in the human mind.

Numbers are ideas. The words that represent them originated as symbols. The figures (XV), (15) and (fifteen) are entirely different symbols yet they represent the same numerical values. All mathematics is concerned with recording by means of signs and symbols some kinds of relationships.

The process of addition probably arose originally out of the physical process of combining two or more groups of objects. After repeating this process a number of times and finding that the same result was always obtained, it was no longer necessary to employ the physical processes, the same result could be obtained by a simple mental process worked out on paper with the use of signs and symbols. The process of subtraction evolved in the same manner with the physical processes no longer necessary.

The processes of multiplication and division were a little more complicated, but through the same processes worked out by means of physical application, multiplication and division were proved to be simplified methods of addition and subtraction, although it was discovered that in order to obtain the proper result in some cases, a certain alignment of the components was necessary, as for instance, when one number is multiplied by another number, the right result can be obtained only under certain conditions, when they are aligned in a straight line, or at right angles to each other. (Examples of this are given in Chapter VIII.)

The Hindus brought another innovation into the use of

$\overline{\text{I}}$	$\overline{\text{II}}$	$\overline{\text{III}}$	$\overline{\text{IIII}}$	$\overline{\text{IIIII}}$
6	7	8	9	10

The Greeks employed the letters of the alphabet to represent numbers:

A	B	Γ	Δ	E	Z	H	Θ	I
1	2	3	4	5	6	7	8	9

The Romans modified this by having certain letters arranged in different positions to indicate different numbers:

I	II	III	IV	V	VI	VII	VIII	IX
1	2	3	4	5	6	7	8	9

X	XI	XII	L	C	D	M	X
10	11	12	50	100	500	1,000	10,000

The system of numbers which we use today, made up of the so-called Arabic numerals: 1 2 3 4 5 6, was probably invented by the Hindus of India about A.D. 500. The Arabians became acquainted with this system about A.D. 775, and brought it along with them to Spain. Europe finally adopted this system about A.D. 1300.

All alphabetical and mathematical symbols and signs are made perceptive to the human mind through their sense of direction, position and form.

Earliest	Chinese	Greek	Roman	Arabic
I	I	A	I	1
II	II	B	II	2
III	III	Γ	III	3
IIII	IIII	Δ	IV	4
IIIII	IIIII	E	V	5
IIIIII	$\overline{\text{I}}$	Z	VI	6
IIIIIII	$\overline{\text{II}}$	H	VII	7
IIIIIIII	$\overline{\text{III}}$	Θ	VIII	8
IIIIIIIII	$\overline{\text{IIII}}$	I	IX	9
IIIIIIIIII	$\overline{\text{IIIII}}$	J	X	10

with the physical acts through which they came into being, and in many equations the signs themselves are omitted for the sake of simplicity and brevity

It is in this manner that the use of mathematical signs to indicate the directions of lines or physical forces took on real significance and mathematics became the language of direction Direction is so pertinent to our everyday concepts that the mind could not function logically without it Direction is just as important to the proper functioning of the human mind as are the concepts of space and time, but we do not recognize direction as a co ordinate because it is hidden behind the mathematical, linguistic and phonetic signs and symbols which we have learned to employ

Symbols are mere abbreviations of words, and this is perhaps the most important advantage of symbolism Mathematics is often referred to as the science of common sense Actually it may transcend common sense and go beyond either imagination or intuition

Mathematics has become a very strange and perhaps frightening subject from the ordinary point of view, but anyone who penetrates into it will find a veritable fairyland which is strange but makes sense It makes sense because sense and direction are synonymously one and the same thing Without direction there could be no sense of any nature—no sense of direction, sense of form, sense of size, distance or motion These are all made sentient in the human mind through a sense of direction Direction is the basis of all sense and sensory perception Mathematics is the medium through which space and time can be united and transformed into sensible quantities and qualities, making the time space manifold a reality, but we must not overlook the fact that the manifold can not be restricted to time and space alone, it is a manifold of time space-direction in which direction is the sense co-ordinate supplied through the use of mathematical signs, or implied when the mathematical signs are omitted, as in many equations in use today

mathematical signs when they employed the (+) sign to indicate one direction, and the (—) sign to indicate the opposite direction They illustrated the distinction between these two signs by drawing lines in opposite directions

The negative number was considered false in Europe until Descartes, the great French mathematician and philosopher, removed the difficulty in 1637 in his treatise on geometry, in which he gave opposite signs to perpendicular distances measured in opposite directions from a line Descartes thus put the negative sign on an equal footing with the positive sign by imputing to them opposite directions

With this innovation, mathematics began to be used more extensively in solving practical problems in physics and chemistry Certain facts regarding triangles are fundamental in reckoning distances The mathematics of triangles and circles are the keys which have unlocked the secrets of the radio, the x ray, television, and many other inventions The Egyptians found that mathematical equations were useful in solving many physical problems

The Greeks, in contrast with the Egyptians, were abstract thinkers of great ability They liked to employ signs as abstract symbols by means of which they could reason logically, finding more satisfaction and dignity in this supposedly abstract thinking Through the use of mathematical signs they were introducing a third co ordinate into their reasoning, the co-ordinate direction, which, when properly employed, supplied the necessary gimmick for making their equations sensible

The written language of mathematics possesses several sets of symbols and signs, some of which convey similar meanings, thus, four times four may be written (4×4), $(4\cdot4)$, $(4(4))$ The raising of a number to a power arose when the convenience of writing $(4\times4\times4\times4)$ became (4^4), and the process of extracting a root became $\sqrt[4]{4}$

We have become so accustomed to the use of mathematical signs that it no longer becomes necessary to associate them

When arrowheads are placed on these lines, they supply an additional sense of direction, or direction of motion, to the line (Fig. 2).

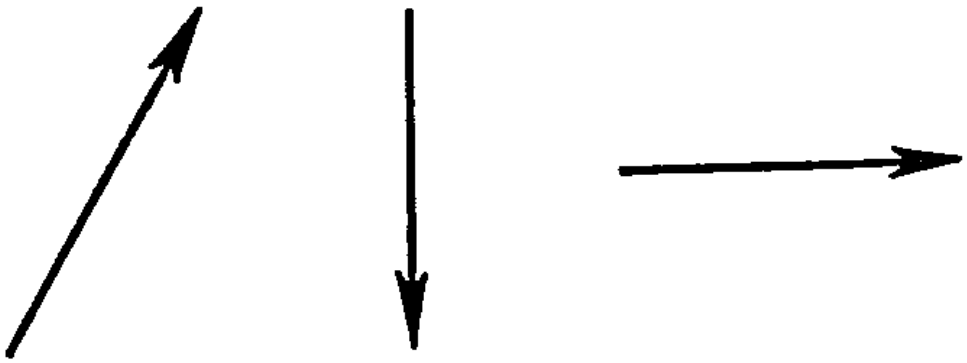


Fig. 2

To indicate an object or mass of three dimensions, it is necessary to draw three lines at right angles to each other (Fig. 3).

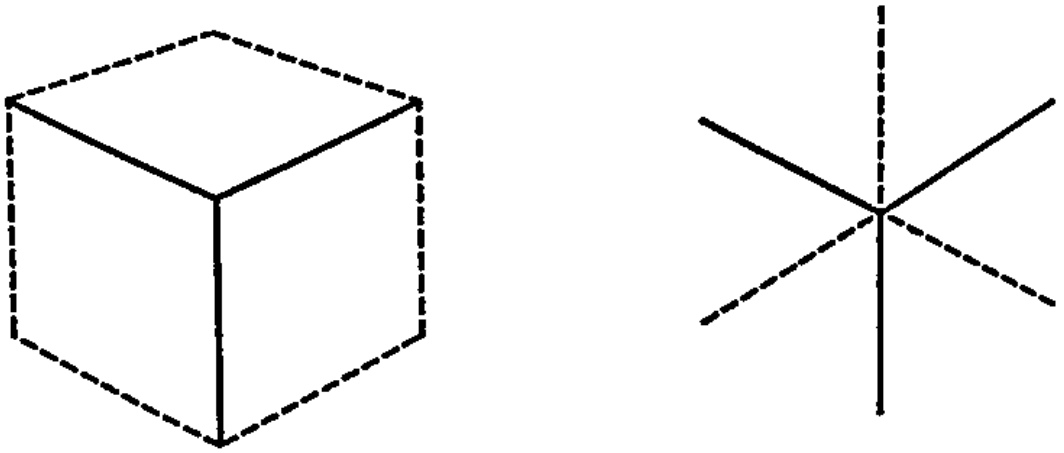


Fig. 3

When arrowheads are placed on the orthogonal lines of a three dimensional drawing pointing either inward or outward, the inward arrowheads indicate a centripetal sense of direction or force; the outward arrowheads, a centrifugal sense of direction of force (Figs. 4, 5).

J Brownowski, in his book, "The Common Sense of Science," states

> We are all aware, although we rarely think about it, that all human forethought depends on our recognizing or putting some kind of order into the world In Euclid s world everything happens as has been foretold Or so mathematicians thought, until the recent flutter caused by the existence of theorems which cannot be proved either true or false Of course, Euclid s world happens to contain no time, and this is a difference of far reaching meaning Nevertheless, we have grown accustomed for three hundred years to think all laws like his, precise, determinate, and invariable In a world with time in it, they are causal laws, and these are the laws which we have thought to be the essence of science

Euclid's world, although it did not contain time, did contain both space and direction, the symbols for space being supplied through his "magnitudes" or "elements," as he called them, while direction was supplied through his mathematical signs, his "data"

Direction is defined "The line or course upon which any thing is moving or aimed to move, or to which anything is pointing, also line of tendency, a trend"

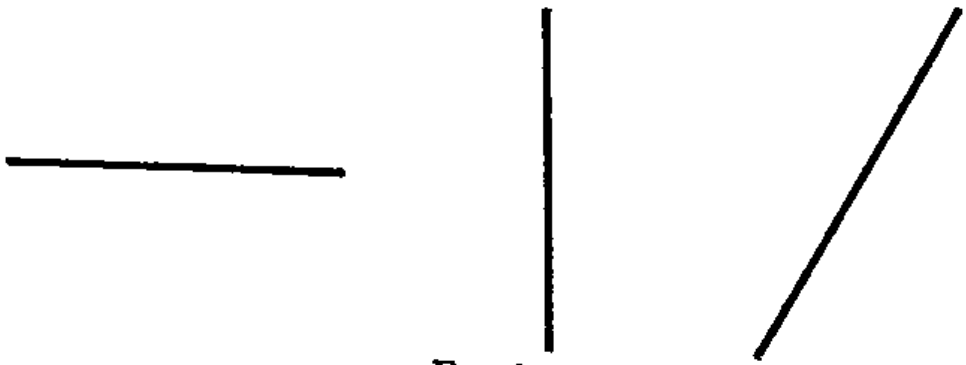
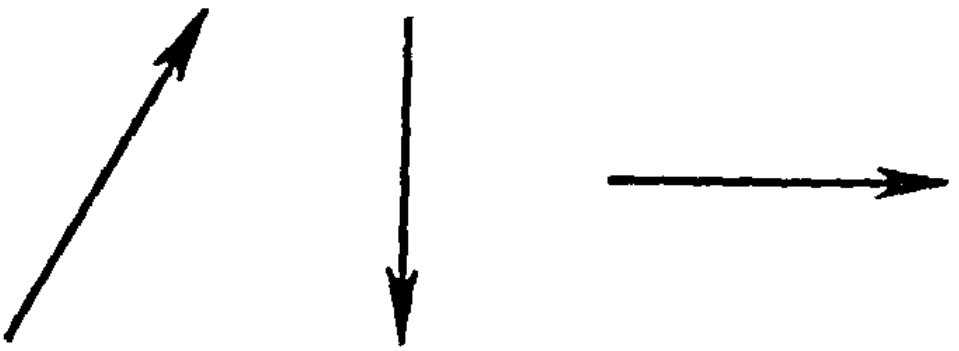


Fig 1

A line can be drawn in any direction on a piece of paper (Fig 1)

When arrowheads are placed on these lines, they supply an additional sense of direction, or direction of motion, to the line (Fig. 2).



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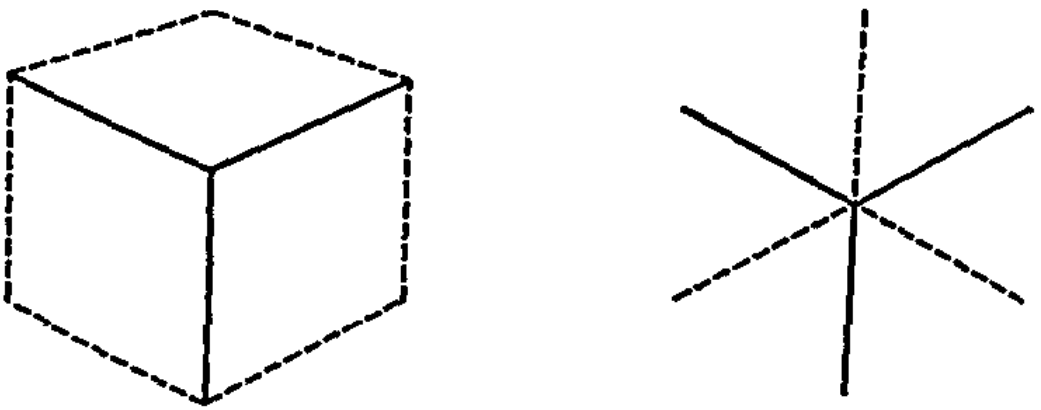

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When arrowheads are placed on the orthogonal lines of a three dimensional drawing pointing either inward or outward, the inward arrowheads indicate a centripetal sense of direction or force; the outward arrowheads, a centrifugal sense of direction of force (Figs. 4, 5).

Centripetal

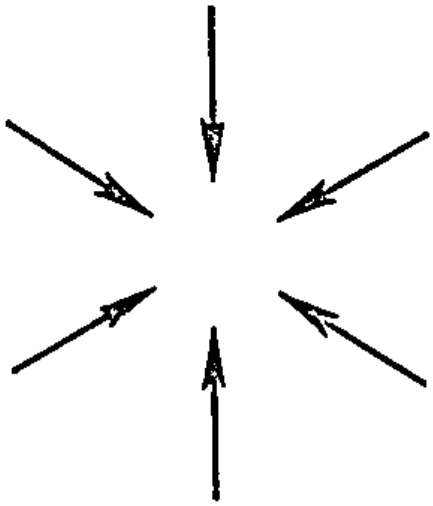

Fig 5

Centrifugal

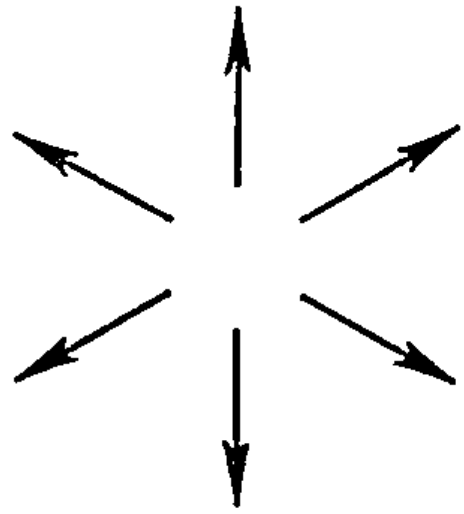

Fig 4

J F S Ross, a pioneer in the study of gyroscopic physics and the laws of direction, states in his book, "An Introduction to the Principles of Mechanics".

In considering any force there are two of its properties which we notice at once One is magnitude or size; the other is that it acts in some definite direction

Forces are not the only quantities which possess these two properties of magnitude and direction Any such quantity is termed a vector quantity Many other quantities which occur in mechanics have magnitude but not direction These are termed scalar quantities

Momentum may be considered to be composed of three factors, viz, (1) the mass of a body, (2) the speed of a body, and (3) the direction in which it moves The momentum will only be constant so long as each of these three factors are constant If any one of the factors is changed the momentum of the body is necessarily changed

The important thing to remember is that the momentum must change if any one or more of these factors is changed The fact that a change of direction of motion produces a change of momentum needs special emphasis because it is the factor most likely to escape attention

Friction is a force It must necessarily possess the three properties of magnitude, direction and sense The sense of the force of

friction between two surfaces is always contrary to that of the force which produces or attempts to produce sliding"

This statement may help somewhat to clear up the distinction between direction and sense of direction A force may take any direction of motion whereas those forces which oppose it, while they may have no direction or motion, have a sense of direction opposite to the force, tending to slow it down or stop it

The mathematician accepts these explanations of direction, the sense of direction and momentum They are considered as mathematical laws which have been incorporated into the signs which the mathematician uses When he formulates an equation he employs a plus (+) sign to indicate forces acting in the same direction, and a minus (—) sign to indicate forces acting in the opposite direction

The plus sign is also used to indicate two or more quantities placed near to each other or joined together, two or more forces functioning in the same direction The minus sign is used to indicate two or more quantities which are opposed to each other or functioning in opposite directions There may be no motion or momentum as when bodies oppose the motion of other bodies, but the sense of direction indicates the use of the minus sign

The same symbols are used to indicate positive and negative electric currents and magnetic fluxes although it is not known whether or not there is actually any motion or merely a sense of direction which indicates the use of opposite signs

The dictionary defines sense, (Geometry) to indicate one of two opposite directions in which a line, surface or volume may be supposed to be described by the motion of a point, line or surface, or to be reckoned, opposite sense being denoted by opposite signs (+) and (—)

To clarify some of the laws of direction we will quote Ross

> If a body is moving with uniform velocity, then it passes through equal distances, all in the same direction, in equal intervals of time; that is, its speed is constant, and its direction of motion is also constant If a body is moving with variable velocity, then either

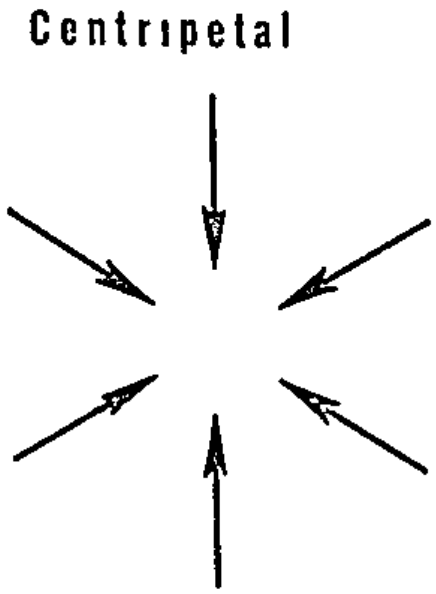

Fig 5

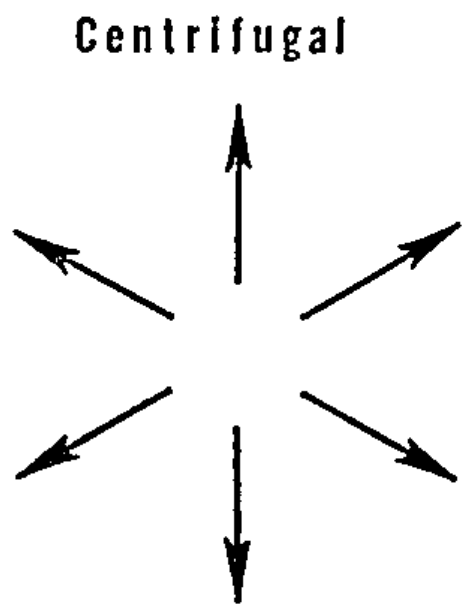

Fig 4

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The important thing to remember is that the momentum must change if any one or more of these factors is changed The fact that a change of direction of motion produces a change of momentum needs special emphasis because it is the factor most likely to escape attention

Friction is a force It must necessarily possess the three properties of magnitude, direction and sense The sense of the force of

senses of direction which come to our brains through our eyes, ears and finger tips. Basically it is these same senses of direction that have been incorporated into our mathematics that enable the mathematician to differentiate between different forms of energy, just as the human mind is enabled to differentiate forms of energy which come to it through the sensory organs.

E. Schrodinger, in his "Science and Humanism," comes forth with the statement: "Form not substance, the fundamental concept."

In describing an iron letter-weight in the form of a Great Dane left to him by his father, he states:

> For we can see in this example as in many others, how in palpable bodies, composed of many atoms, individuality arises out of the structure of their composition, out of shape or form, or organization, as we might call it in other cases. Scientifically this goes back to Aristole, his causa materialis and causa formalis.
>
> It is true that in thinking about the atom, in drafting theories to meet the observed facts, we do very often draw geometrical pictures on the blackboard, or on a piece of paper, or more often just only in our minds, the details of the picture being given with much greater precision and in much handier fashion by a mathematical formula than pencil or pen could ever give.

This is so because the mathematician can indicate direction through his use of signs and symbols much more accurately and precisely than he could possibly indicate it in a drawing, especially if limited to two dimensions.

Bertrand Russell, in his book, "Human Knowledge" states:

> The question of interpretation has been unduly neglected. So long as we remain in the region of mathematical formulas, everything appears precise, but when we seek to interpret them it turns out that the precision is partly illusory. Until this matter has been cleared up, we cannot tell with any exactitude what any given science is asserting.

If it were not for the senses of direction supplied to the brain through the sensory organs there could be no consciousness in the world; and if it were not for the senses of direction of the axes of inanimate matter and energy, there could be no uniform-

the speed, or the direction of motion, or both may be changed The term speed is used to indicate a scalar quantity where no specific direction is indicated, in contrast with velocity, which is used to indicate a specific direction

Ross goes on to state

We must never forget that velocity only remains constant so long as both its magnitude and its direction remain unaltered A change in direction is a change in velocity just as truly as is a change in speed

In regard to energy he states

Energy is the capacity for doing work Work is a scalar quantity, the force which does the work has, of course, direction, but work itself has magnitude only, there is no idea of direction involved We say that a body possesses energy when by reason of its position or condition it is capable of doing work Energy is clearly a scalar quantity, it takes no account of direction

This is a misleading interpretation of the term "energy," for energy indicates direction just as truly as the term, friction, indicates direction If it were not for the potential directions of motion, positions, or senses of direction in each form of energy, it would not exist as either kinetic or potential energy It is impossible to conceive of energy of any nature without implying either a direction of motion, a position or a sense of direction

It is through a sense of direction incorporated within our mathematical signs that we are enabled to combine space and time in what has come to be known as the space time manifold If it were not for the sense of direction incorporated in our mathematical signs, the human mind would be unable to conceive of space, time or energy of any nature, for direction is a primary co ordinate in any concept of space and time

Ross states that energy takes no account of direction, and yet every equation which he uses has direction hidden within its mathematical signs

The mathematician is made conscious of the values in his mathematical equations through the use of mathematical signs, just as we are made conscious of things about us through the

In general, however, the world picture of the second half of the nineteenth century and the explanation it offered for evolution was not the fulfillment, but rather the destruction of Goethe's world picture

It was that world view which is usually denominated the "Mechanistic" The ultimate reality in physical processes obeying strict laws of nature, but void of directiveness and sense the 'Blind play of atoms"

This mechanistic view is the one which must be coordinated and brought into line with a new concept of directiveness and sense A world void of sense and direction cannot exist It would be a world without form, construction or purpose In chemistry, problems of design and structure are basic, as shown already in isomerism chemical compounds consisting of the same atoms but in different arrangements may exhibit very different properties It is the structural plan which is often decisive

The system of modern science which has given us not only theoretical knowledge of nature but has led to the triumph of modern technology, is basically wrong For the system of physical forces and laws is superseded by other agents, hobgoblins, as it were, who direct the events toward a secret goal, organization and wholeness This is the conception called "vitalism" and rightly discarded in biology, because it contradicts empirical evidence, and even threatens its very foundations

The basic problems of wholeness and organization are not solved by the morphological approach But what our time is striving toward is a system of science which does not, as in the case of the mechanistic view, deny and discuss away these problems but rather integrates them into the edifice of the laws of nature We need an exact science dealing with wholeness and organization

Mathematics is a means of stating relationships of time and space through the medium of direction

ity to matter, no consistency to energy, no sensitivity of any nature

The senses of direction that give form and consistency to matter and energy are the same as the senses of direction that enable the human mind to be conscious of forms of energy and matter What the mathematician has done is to apply signs and symbols to these senses of direction so that he can formulate an equation for combining time and space

When we are made to realize that a true concept of energy must have as one of its co ordinates a sense of direction, as well as the properties of space and the motions of time, then, and not until then, will we be enabled to develop a clearer under standing not only of the causes and means of creating energy, but also the purposes and reasons for its creation, including the creation of life itself

It is because of a lack of understanding of direction as a co ordinate that we have been led into this present epoch in which time and space, or the newer concept of a time space manifold, are considered the only things of importance Whether we are willing to recognize it and accept it or not, every form of energy, every unit of matter, everything perceptible to the human mind, including the mind itself, must possess senses of direction, not only to enable it to function correctly, but even to function at all

While the term energy does not necessarily indicate direction, the creation of energy, its transformations and functions, can be explained and analyzed only through the semantics of direction which have been incorporated into our mathematical signs and symbols

Professor Edmund W Sinnott of Yale recently wrote an article entitled, 'The Biology of Purpose,' in which he states

> With man of course the complexity of the environment is vastly greater and is increased through his response to symbols such as spoken and written language

In a recent article on "Goethe's Concept of Nature," Ludwig von Bertalanffy states

When two parallel lines have their senses in the same directions, they are termed supplementary. (Fig. 8); when their

Fig. 8

Fig. 9

senses are in opposite directions, they are termed inverse (Fig. 9).

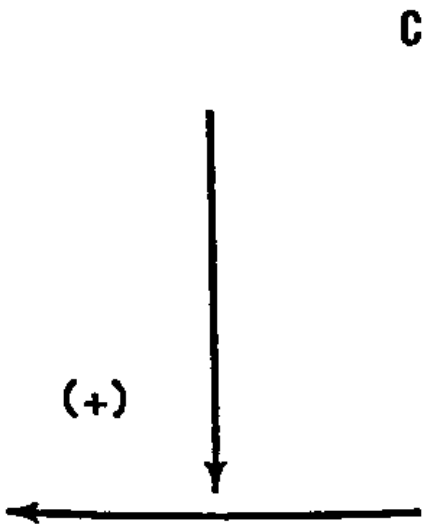


Fig. 10

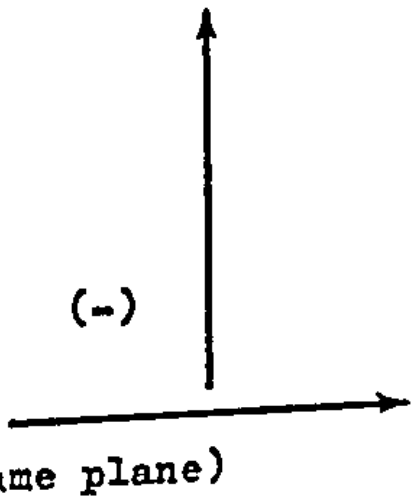


Fig. 11

Two lines or forces perpendicular to each other in the same plane are termed complementary. When their sense is to the left, downward or inward, they are POSITIVE (Fig. 10); when to the right, upward or outward, they are NEGATIVE (Fig. 11).

CHAPTER II

THE PHYSICS OF DIRECTION

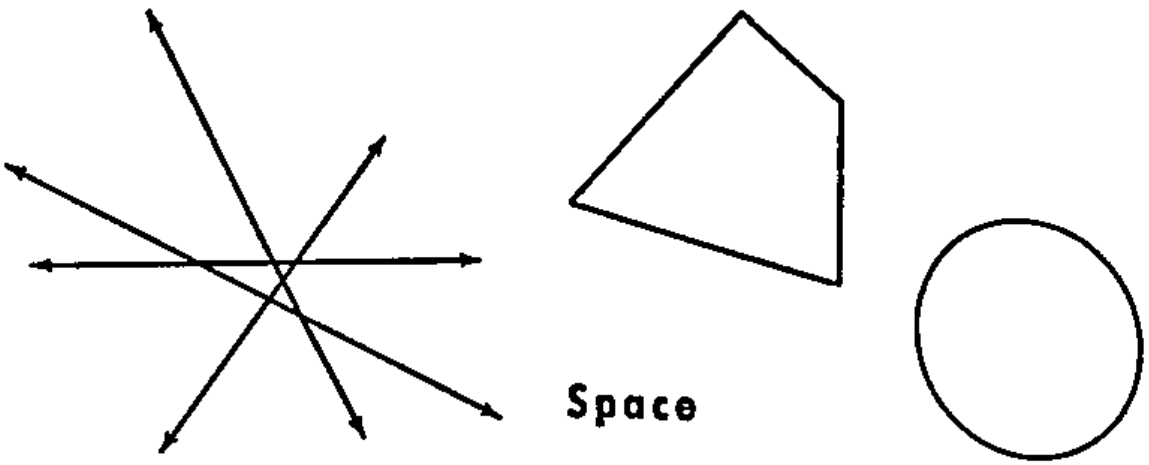


Fig 6

SPACE MAY EXIST as a large open space extending in all directions, or it may be an enclosed space of any shape, round, oval, elliptical, square, rectangular, or any other shape (Fig 6).

Extension

Fig 7

When a point is expanded, it is usually considered to expand equally in all directions, but when it is extended, it is considered to extend in one direction forming a line of one dimension (Fig 7)

2. There is a motion of rotation which functions on an axis of rotation or spin. This axis invariably lines itself up perpen-

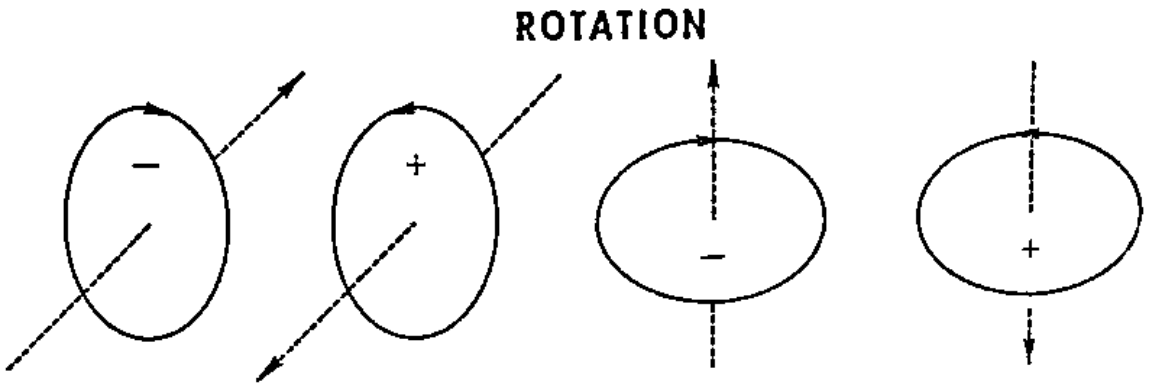


Fig. 15

dicular to the axis of translation. Its direction of motion may be either clockwise (—) negative, or counter-clockwise (+), positive (Fig. 15).

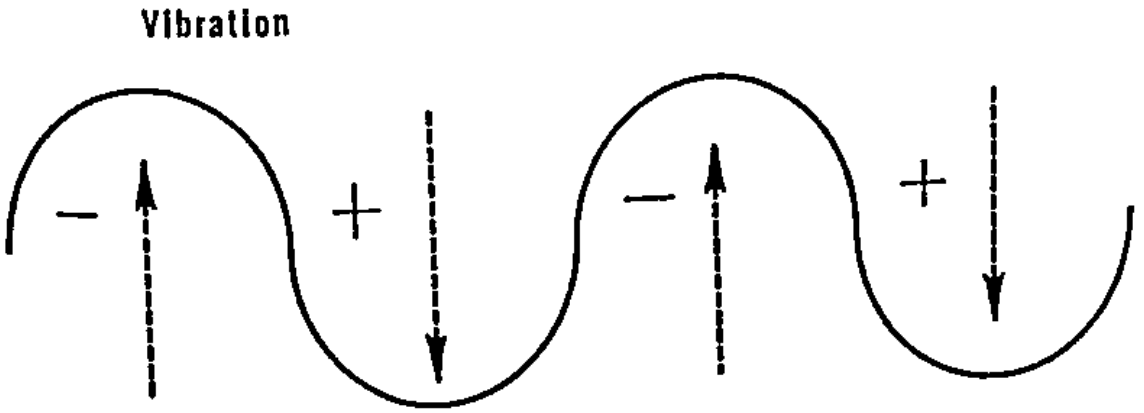
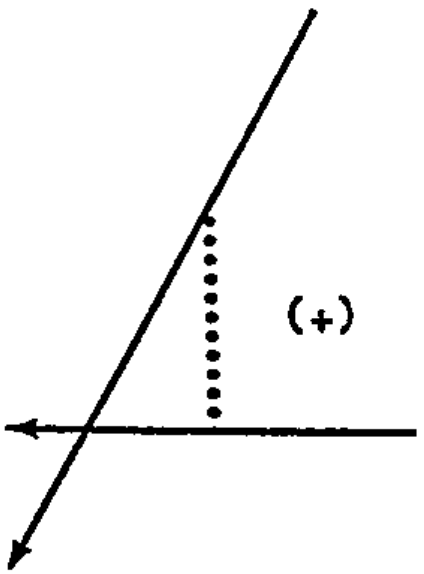


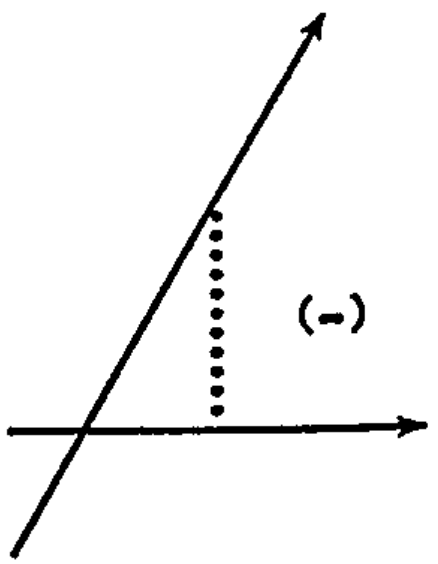
Fig. 16

3. There is a motion of vibration which invariably lines itself up perpendicular to both the motions of translation and the motions of rotation.

When two lines or forces are perpendicular to each other in separate planes, they are termed LATICAL

Latical





(Perpendicular in separate planes)

Fig 12 Fig 13

There are three kinds of motion which function on axes which are mutually perpendicular to each other 1 There is a

Translation

Fig 14

motion of translation which functions along a line of translation (Fig 14)

Energy is not designated by its so-called dimensions even though it has to have the dimensionality which it acquires from its three orthogonal axes. Every form of energy must have an axis of translation; an axis of rotation; and an axis of vibration, to enable it to exist as a form of energy. And while we may be able to perceive only one of the axes on which a form of energy functions, it must also contain the other two axes to give it dimensionality, thus enabling it to exist and be perceptible.

Some forms of energy are made perceptible through their axes of translation; some through their axes of rotation; some through their axes of vibration. Instead of designating them through their axes, we have come to know the various forms of energy by the names that have been given to them, such as: light, heat, gravity, electricity, etc. Each form of energy functions on a different axis, but it must have the other two axes to give it dimensionality and thus enable it to change its form such as the change from light to heat, from heat to electricity, from gravity to matter. We know that matter cannot exist without three dimensions, neither can energy.

The dimensions of energy may be designated:

Length—Axis of translation (or stabilization)

Breadth—Axis of vibration.

Depth—Axis of rotation.

These axes do not take any definite direction of position relative to the finite earth. Any of them may be vertical or horizontal to the earth, but they invariably tend to line themselves up orthogonally to each other, and if for any any reason one or more of them get out of their orthogonal alignment, then the form of energy has to change, for each form of energy must maintain a definite orthogonal alignment of its component axes.

In order to demonstrate this, let us examine some of the recognized instruments for creating and utilizing energy of different natures to see what part direction plays in their creation and transformation.

WAVE MOTION

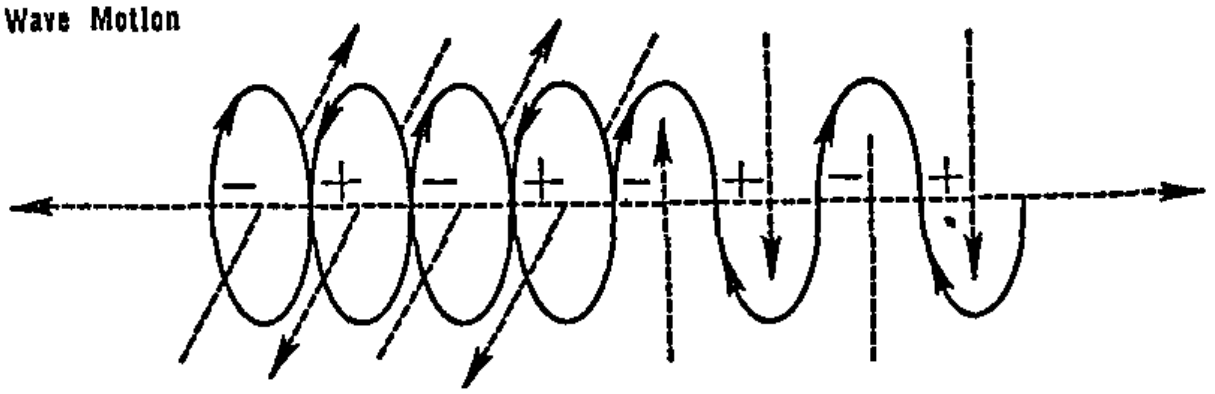


Fig. 17

Waves are made up on all three axes functioning perpendicularly (orthogonal) to each other: TRANSLATION, ROTATION, AND VIBRATION (Fig. 17).

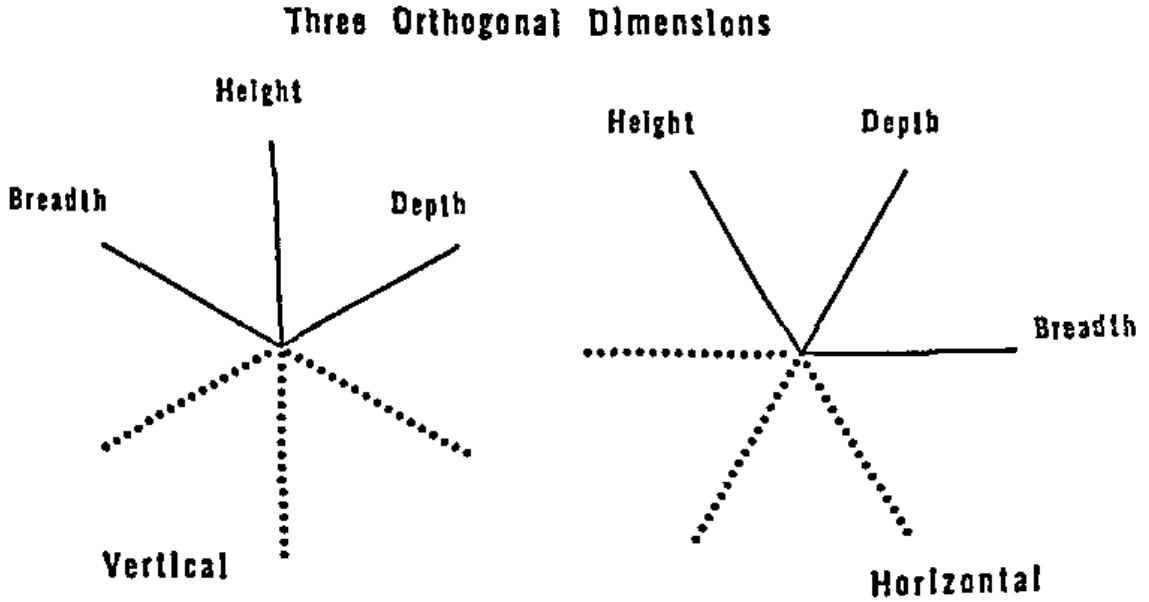


Fig. 18

Space is made perceptible to the human mind through its three orthogonal dimensions: HEIGHT, BREADTH AND DEPTH (Fig. 18).

The main factors in the generation of electrical energy are

1 A magnetic flux
2 The direction and length of the wires which cut the flux
3 The direction and speed of the cutting of the flux

To derive the maximum electrical energy, the field, the length of the wires, and the physical motion must be at right angles to each other The length of the wires must be at right angles to the field, and the direction of rotation must be at right angles to both the field and the length of the wires

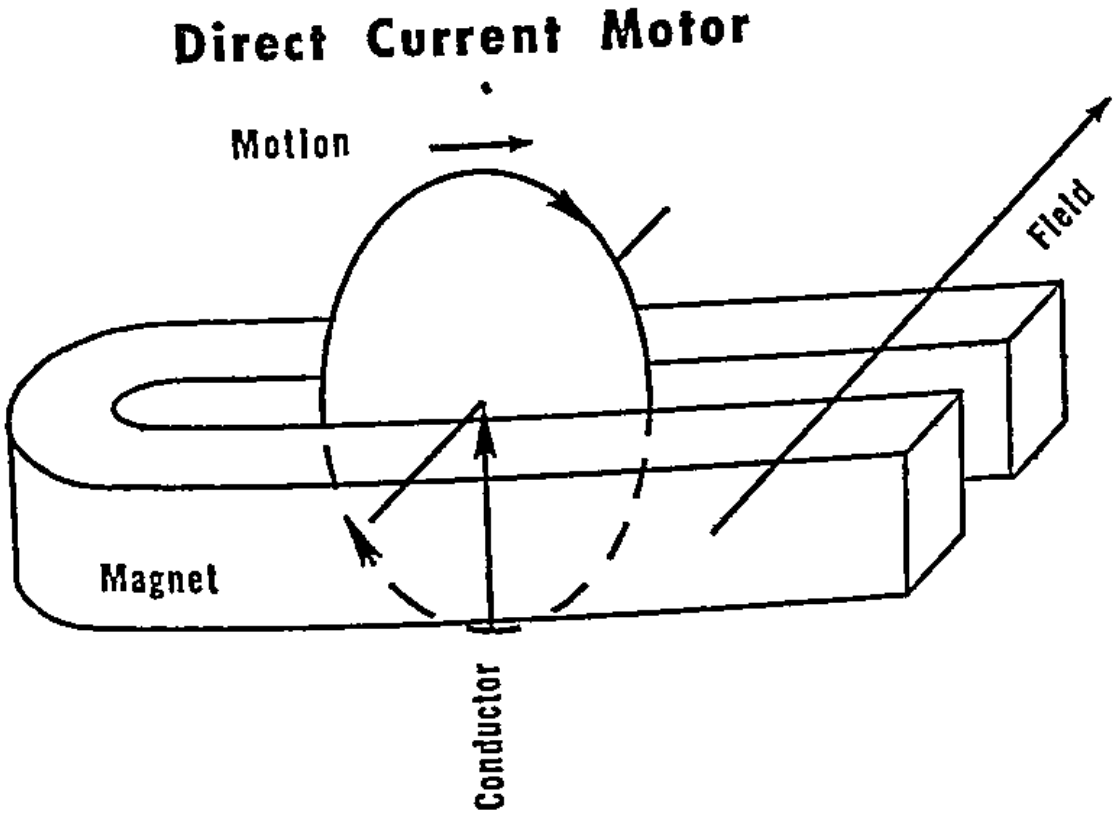
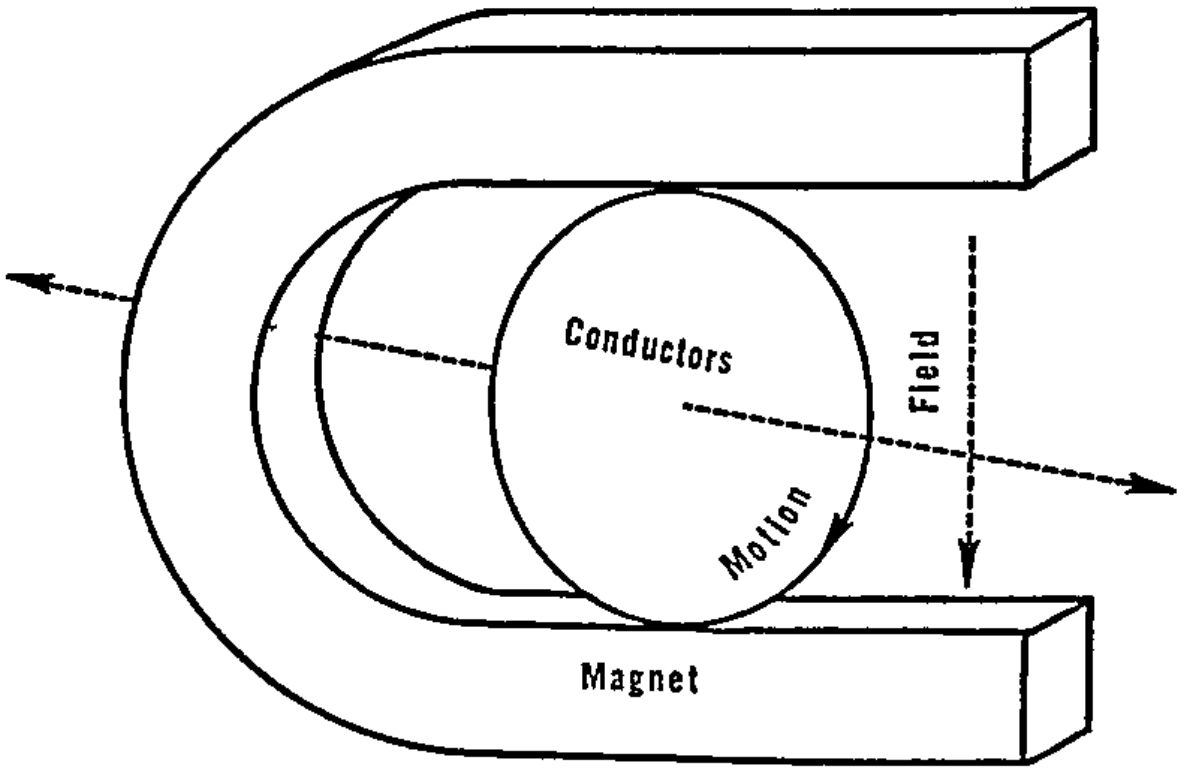


Fig 20

There are two types of electric motors, the alternating current motor (Fig 19) and the direct current motor (Fig 20)

The essential parts of an electric dynamo or motor are (Fig 19) (1) an iron magnet between the poles of which a magnetic field exists, (2) electric conductors through which an electric current may pass, and (3) mechanical motion produced by some outside force



ALTERNATING CURRENT DYNAMO

Fig 19

The chemical composition of the elements is of course an important factor in the generation of electrical energy The magnets are made of ferro-magnetic metal, while the conductors are usually made of copper because of its high electric conductivity

The conductors are mounted on a rotating structure so that they cut the flux of the magnetic field at right angles As the conductors move across the face of the poles of the magnet, an electric current is induced which is carried out along the lengths of the conductors

and the flow of water is at right angles to the radius of the wheel (Fig. 21).

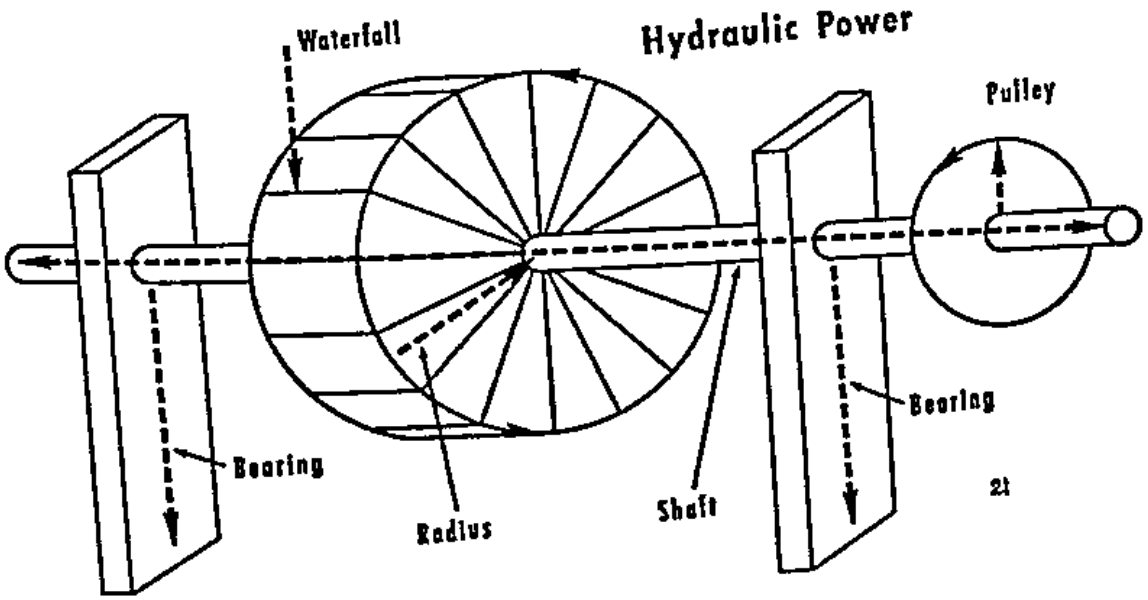


Fig. 21

As the weight of the water forces the wheel around, the pull of gravity at the periphery of the wheel is transferred perpendicularly along the spokes of the wheel to the axis or shaft, where is is again transferred at right angles outward laterally along the shaft. Thus it becomes evident that the same principle which governed the direction of the components of electrical energy also governs the direction of the components of mechanical energy.

The pull of gravity on the periphery of the wheel, which is transferred radially to the shaft is again transferred laterally along the shaft to a gear, thus bringing the gear and the wheel parallel to each other. The radius of the wheel and the radius of the gear together with the pull of gravity on the periphery of the wheel are the three factors used in determining the ratio of energy transmitted from the periphery of the wheel to the periphery of the gear.

The alternating and direct current motors utilize positive and negative electricity due to the reversing of the direction of

In the alternating current motor, the conductors are parallel to the axis of rotation, while in the direct current motor, they are perpendicular.

The alternating current dynamo generates an alternating positive and negative current, because the conductors cut the flux in opposite directions as they rotate between the opposite poles; while in the direct current motor, the conductors cut the flux in one steady direction, the positive and negative directions of the conductors, depending upon the direction of motion. If the direction of motion is reversed, the positive and negative poles will be reversed.

It makes little difference whether the conductors rotate within a stationary magnet, or the magnet rotates within stationary conductors, so long as the flux, the length of the conductors and the physical motion are orthogonal. The electric potential is at a maximum when the conductors are opposite the center of the face of the pole, and the direction of motion is at right angles to the flux. The frequency of the current is proportionate to the rate of speed at which the lines of flux are cut. The electrical energy developed is proportionate to the mechanical energy absorbed.

An electric current passing through a wire carries with it a magnetic flux which functions at right angles to the flow of the current. This can be demonstrated by placing a magnetic needle next to a wire carrying a positive or negative electric current. The sensitized compass will point at right angles to the flow of the current indicating the perpendicular direction (+) or (—) of the magnetic flux.

To gain a clearer picture of direction as applied to electrical energy let us compare the direction of the components of electrical energy to the components of mechanical energy as demonstrated by the mechanical energy of a water-wheel.

The flux of the water-wheel is the waterfall. In place of the copper conductors the water-wheel has troughs. The troughs cut the flow of water at right angles, the greatest pressure being exerted when each trough is at right angles to the flow of water

tioning orthogonally to each other, energy loses its dimensionality and is unable to function creatively.

In order to grasp the significance of this last statement, it will be necessary to delve into a study of precession, as demonstrated by the gyroscopic compass, to explain what part direction really plays in the creation and transformation of various forms of energy.

Direction and Precession

People do not think of direction as a co-ordinate of energy in the same manner that they think of time and space as co-ordinates. Direction is just as much a co-ordinate of existence as are time and space.

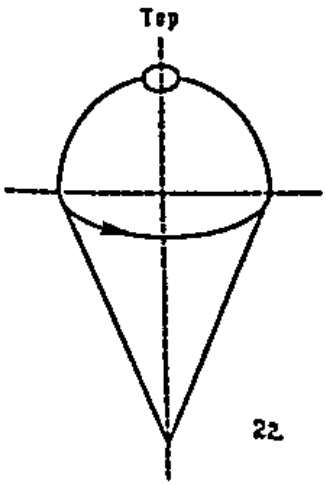


Fig. 22

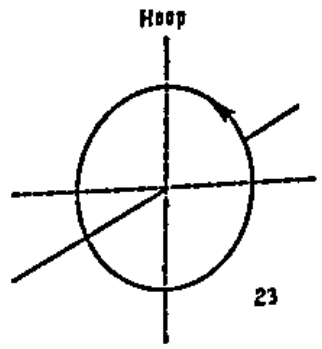


Fig. 23

A top spins with its axis vertical to the earth (Fig. 22); while a hoop rolls along the ground with its axis horizontal (Fig. 23).

The positions and motions of these toys are more or less taken for granted, but when analyzed in accordance with the theory of the orthogonality of the axes of motion, it is found that there is a very definite reason why these toys function as they do.

A top spins with its axis vertical to the earth because by so doing its plane of rotation is perpendicular to the pull of gravity,

motion of the cutting of the flux The same factor can be produced in the water wheel by directing the flow of water so that it makes the wheel rotate in the opposite direction If the water wheel is placed so that the water turns the wheel in the opposite direction, all subsequent mechanical energy is reversed Instead of positive and negative mechanical energy it is designated as forward or backward, clockwise or counter-clockwise rotation, depending upon the position of the observer

The gears attached to the shaft function at right angles to the shaft just as the magnetic flux functions at right angles to the current The direction of energy is similar in both cases

The total force of the water wheel is transferred laterally along the shaft to the gear It makes little difference whether the gear is a few feet from the wheel or a number of feet from it—the transmission of energy along the shaft is the same irrespective of the length of the shaft (disregarding for the moment the various factors of friction, tensile strength, etc)

Each revolution of the water wheel produces one revolution of energy at any point on the shaft irrespective of distance The same factors are present in electrical energy where an electric current is similar to shaft energy and magnetism is similar to gear energy

Some of the energy in the shaft may be lost through friction which changes the energy from mechanical energy into the chemical energy of heat The change in the form of energy is brought about because of the perpendicular change in direction in which energy is transformed from an axis of translation to an axis of rotation

The same principle applies to an electric current When an electric current is interrupted in its flow and made to rotate about an iron core, the electrical energy is changed from an electric current to a magnetic force

All energy has rotational, vibrational and translational co ordinates through which it is enabled to function creatively, whether it be mechanical, electrical, chemical, radio active, or any other form of energy Without all three co ordinates func

Kepler was perhaps the first to designate the axis of the force of gravity as a *Radius Vector*[1]

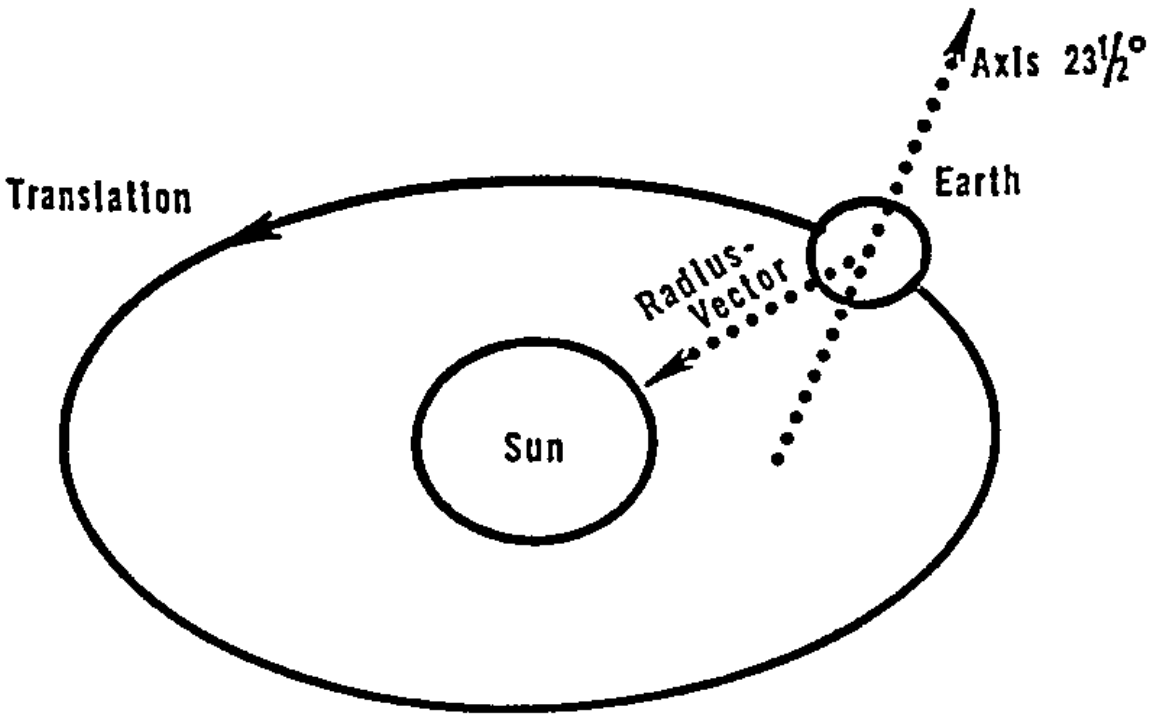


Fig 25

The radius vector is the line along which the force of gravity functions There is no translation of the heavenly bodies along the line, it is merely an axis along which the force of gravity functions setting up a tripartite orthogonal axis to complement the axis of rotation around which the planets rotate, and the axis of translation—the orbit, along which the planets travel This leads to the conclusion that the force of gravity must function along an axis of vibration, thus setting up the orthogonality of the three axes an axis of vibration, an axis of rotation, and an axis of translation, so necesary to the functioning of every form of energy

[1] Radius-vector—1 Math A linear co-ordinate in a system of polar co-ordinates A straight segment (or its length) from a fixed point (or pole, or center) to a variable point. 2 Astronomy A straight line joining the center of an attracting body with that of a body describing an orbit around it, as a line joining the Sun and the Earth

and its axis of spin is perpendicular to the motion of the surface of the earth

A rolling hoop, on the other hand, maintains its axis in a horizontal position because by so doing it is perpendicular both to the pull of gravity and to the axis of translation along which the hoop is traveling

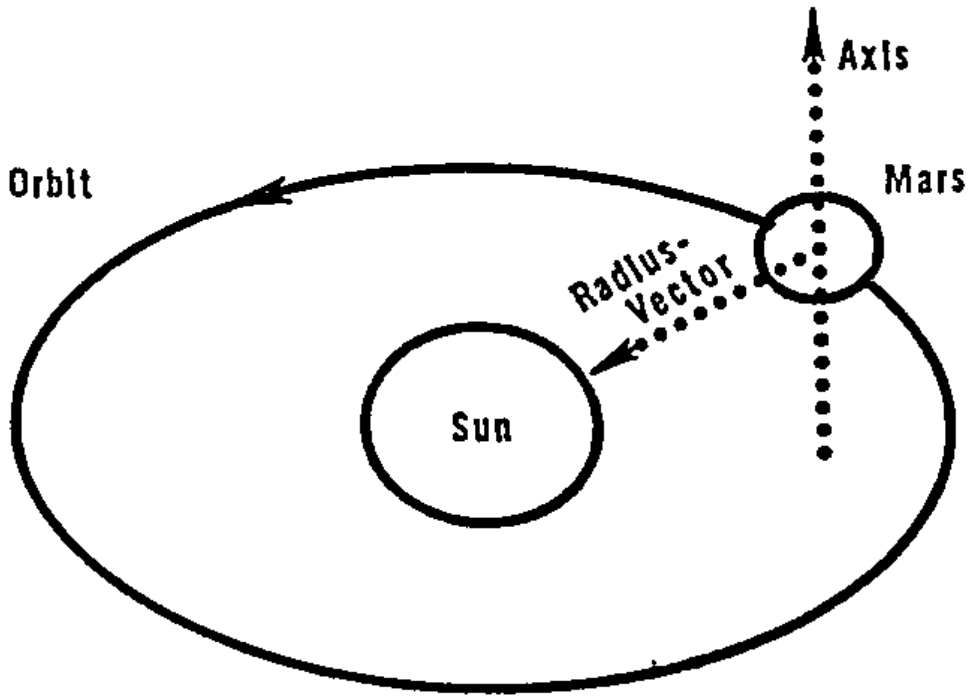


Fig 24

Johann Kepler, a German astronomer, (1751 1630), after twenty years of research and study, announced in his Har monice Mundi, that, 'The square of the periodic time of the planet Mars is proportional to the cube of its mean distance from the sun" This is known as Kepler's Third Law After enormous labor, and by a process of trial and error, he found that, (1) the planet's orbit was an ellipse, of which the Sun is one focus, and (2), that as the planet describes its orbit, its radius vector traverses equal areas in equal time (Fig 24) These are known as Kepler's First and Second Laws respectively These laws formed the groundwork of Newton's discoveries of the force of gravity, and the starting point of modern astronomy

while the gyro-compass utilizes the earth's rotation for that purpose.

The magnetic compass consists of a box or protecting framework in the center of which is a supporting pivot on which the magnetized needle swings. The needle is perfectly balanced to offset the pull of gravity, thus permitting the needle to swing freely to indicate the magnetic poles (Fig. 26). If the force of gravity, the magnetism of the earth or the radial motion of the needle is interfered with in any way the compass will not function properly.

THE GYROSCOPE

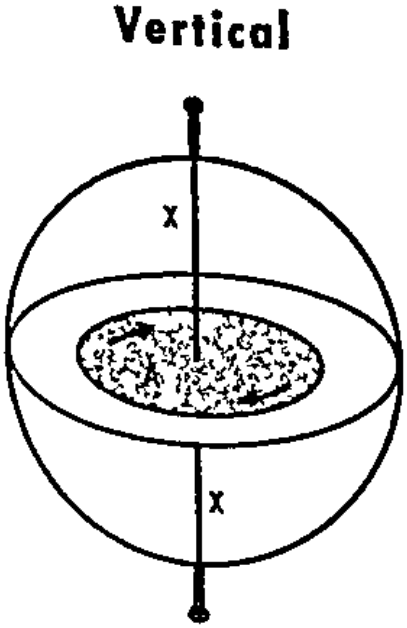


Fig. 27

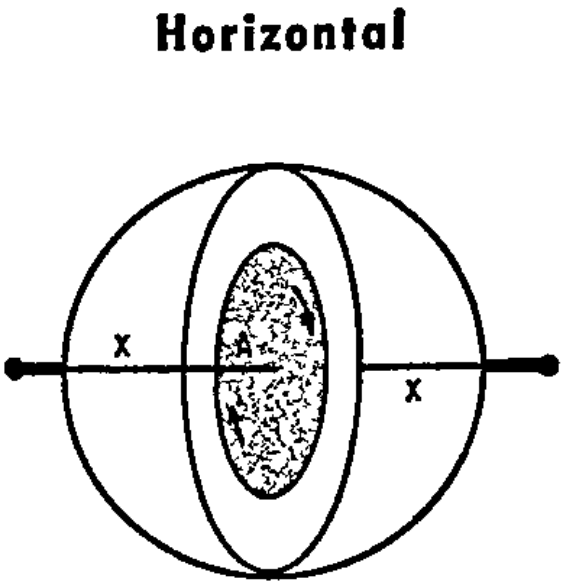


Fig. 28

A toy gyroscope is a wheel supported within a framework so that the axle of the wheel is free to rotate in any position or direction. The frame can be turned so that the wheel will rotate straight up and down, sideways or in any other position, but it will be found that no matter in what position the gyro is placed, when spun rapidly it inevitably turns so that its axle is either vertical (Fig. 27), or horizontal to the earth (Fig. 28).

The axis of the earth, it will be noticed, is not perpendicular to the radius vector or to the orbit It has a deviation of 23½° due to the forces of gravity of other suns and planets throughout the universe It is this deviation of the earth's axis which accounts for the different seasons (Fig 25).

As was pointed out, the power of an electric dynamo and a water wheel is induced through the perpendicular alignment of the components of these instruments In like manner the creative energy of the earth is brought about through the perpendicular alignment of the rotating motion of the earth, on its axis of rotation, the force of gravity with its radius vector acting as an axis of centripetal vibration, and the course along which the earth moves in its orbit which serves as an axis of translation around the sun There are many other factors which have a great bearing on the creativity of this world, but for the moment we will center our attention on these three orthogonal components

COMPASS DIRECTIONS

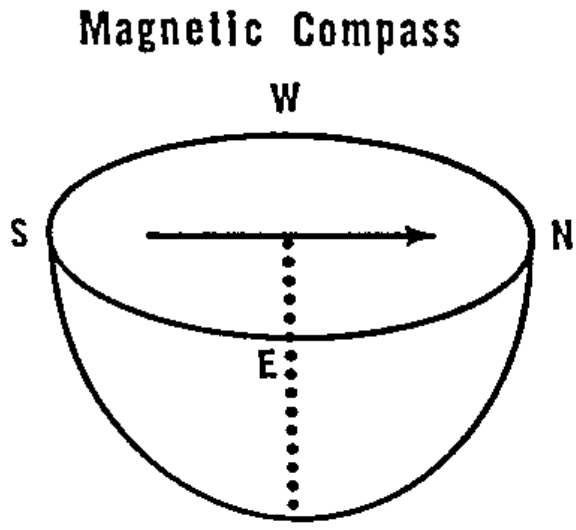
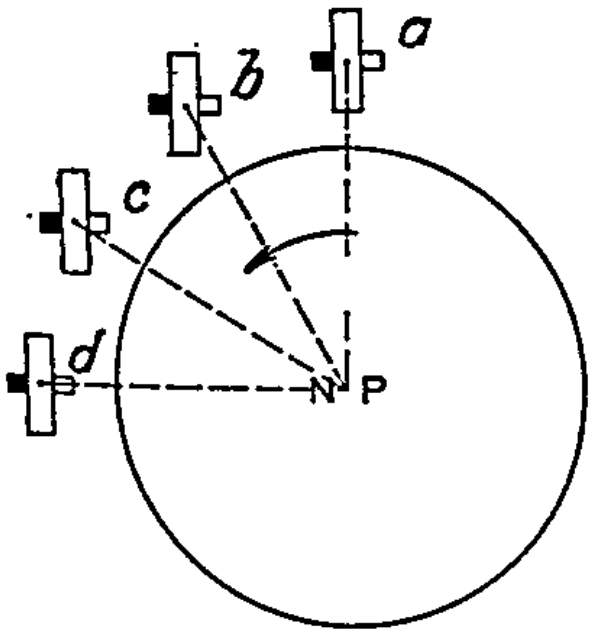


Fig 26

There are two types of compasses used for indicating directions on the earth s surface, the magnetic compass and the gyro compass The magnetic compass makes use of the earth's magnetism to complete its cycle of tripartite perpendicular energy,



A gyroscope universally mounted maintains its axle in a fixed direction in space. This is known as Fixity of Plane. Note that the axle of the simple gyroscope shown at a is parallel to the positions b, c, d, but relative to the earth its axle has apparently tilted.

Fig. 30

A wheel encased in a gyro frame, when spun rapidly, will line up its axle perpendicular to the axis of the earth. As the earth rotates, this axle will appear to turn end over end, but what actually happens is that the axle of the wheel maintains its universal position (fixity of plane) while the rotating earth makes the axle appear to rotate (Fig. 30).

A commercial gyroscope consists of a wheel encased in a frame which permits freedom of motion in any direction. The frame is supported on gimbals (pivots) to enable the wheel freedom of motion in any direction (Fig. 29). The axis of the

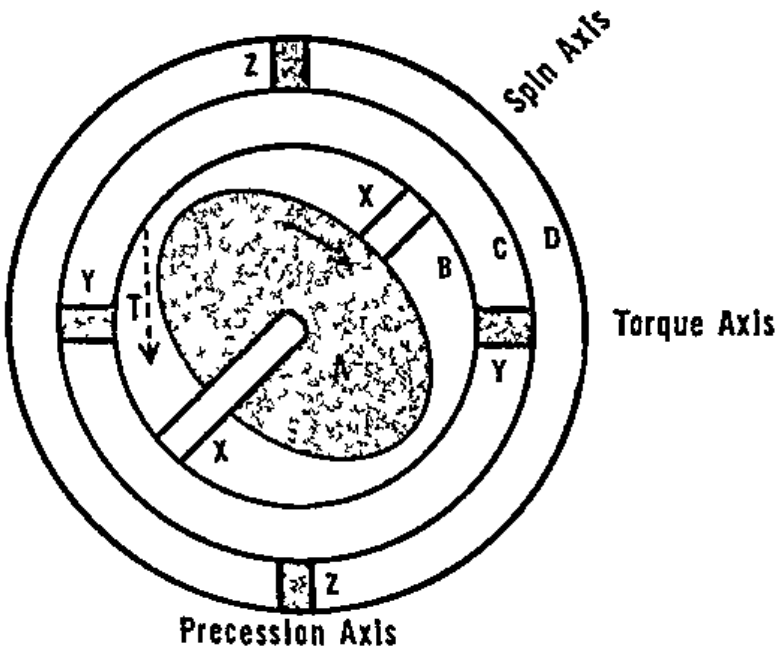


Fig. 29

wheel functions at right angles (x — x) to the gimbals (y — y), and also to the gimbals (z — z), thus permitting the wheel (A) to rotate in any position or direction.

A gyro wheel spinning freely within its framework can set its axis or plane of spin in any direction it desires. It may sound strange to speak of a wheel setting its axis in any position it desires, but this is exactly what happens. If this gyro were an atom floating around in space, the wheel would adopt a plane of rotation and maintain its axis in a definite universal direction just as the earth does.

The first principle of gyroscopic physics comes under the heading "Rigidity of Space," or "Fixity of Plane," which are the tendencies a spinning body exhibits of preserving its directions of motion.

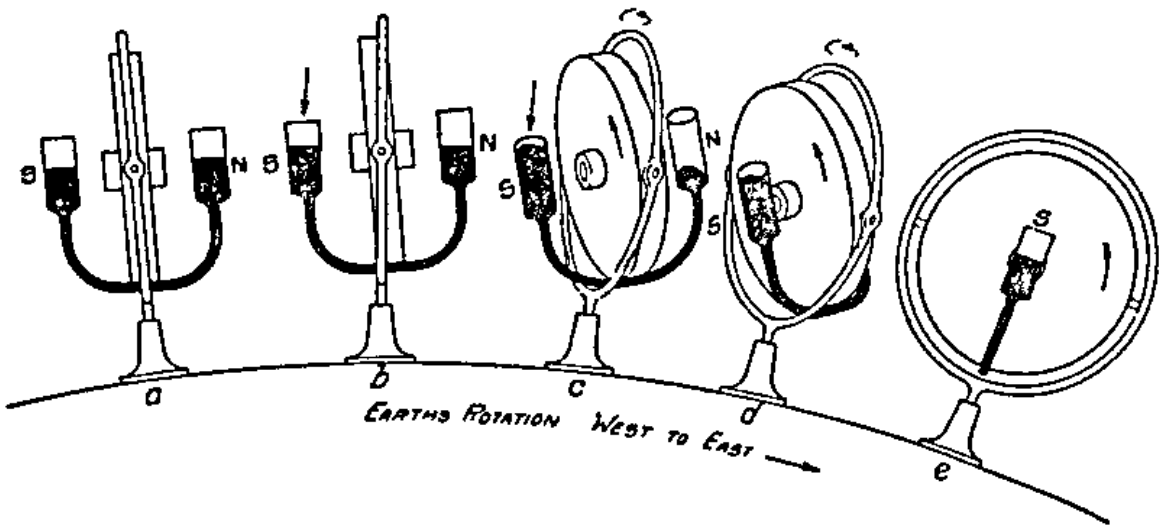
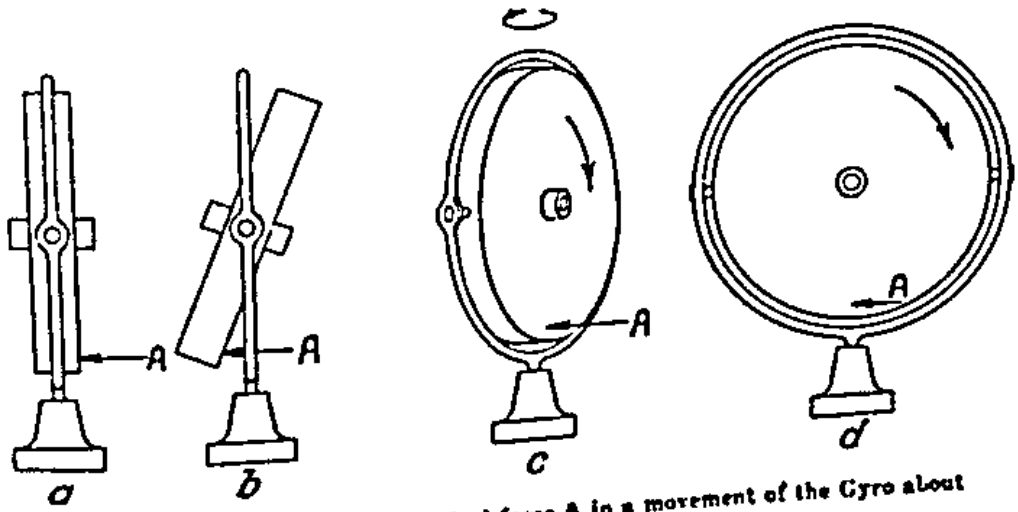


Fig. 32

A couple tending to incline the axis of a rotating body in a given direction, actually causes an inclination of that axis in a plane perpendicular to the given direction (Fig. 32).

Hipparchus (100 B.C.) discovered that the axes of motion of heavenly bodies change their direction in compliance with what he termed, "The Precession of the Equinoxes." He was one of the first to make use of the term Precession to indicate the westward motion of the equinoxes, the equinoxes being the point of

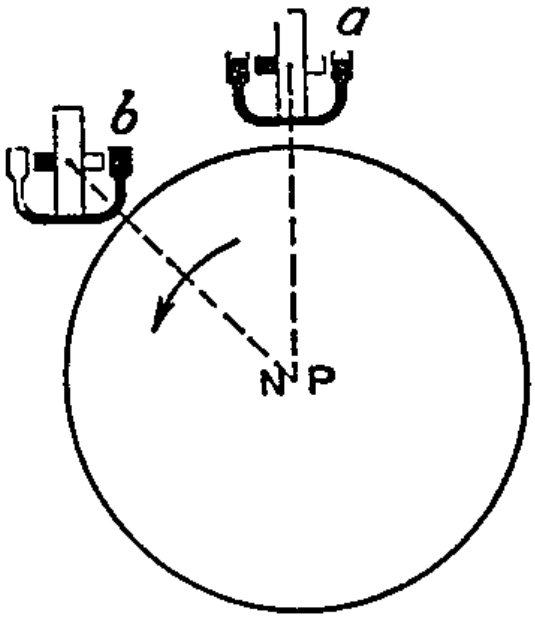


a and b show the effect of an applied force A in a movement of the Gyro about its horizontal axis, when it is not spinning

When the force A is applied to the spinning gyroscope, there will be a movement about the vertical axis as shown in c, which movement will continue until the gyroscope is revolving in the direction of the applied force as shown at d, after which there will be no further movement

Fig. 33

THE GYRO COMPASS



With a mercury tube attached to the gyroscope, Fixity of Plane takes place and due to Gravity the mercury flows to the low side applying a downward pressure

Fig 31

When a gyroscope is changed over into a gyro-compass, this is accomplished by suspending a weight of some nature from the frame of the gyroscope (Fig 31) This weight changes the balance of the frame so that it is affected by the force of gravity of the earth As the earth rotates, instead of maintaining its universal position, the frame pulls on the axle of the wheel causing it to change its direction

One would naturally suppose that the weight on the frame would cause the wheel to be turned so that the axle would remain horizontal to the earth, but the axle does not maintain its universal direction—it turns sideways pointing North and South instead of East and West This is termed, "PRECESSION"

The second principle of gyroscopic physics comes under the heading of Precession—a change in direction of the plane of rotation to the perpendicular due to external forces exerted on the axle of a wheel when in motion

When the axle of the Gyro wheel in the Gyro-Compass is displaced from the true north-south direction, the axle will tilt, since it tends to maintain its fixity of plane, and consequently some method whereby a force may be exerted which will cause the axle to return to the meridian must be provided (Fig. 34-A).

PRECESSION

A U-tube system, partially filled with mercury, mounted perpendicular to the plane of the Gyro wheel and connected to the bottom of the Gyro case, furnishes the necessary force about the horizontal axis of the Gyro wheel to make it precess to the meridian (Fig. 34-B).

This action of the Compass is caused when the Gyro wheel maintains its Fixity of Plane at which time this tilting causes a movement, due to gravity, of the mercury (weight) to the low side, applying a pressure downwardly on that side, resulting in a precessional movement of the Gyro axle towards the meridian, where the tilting stops. Here the Gyro rests, forming the directive element of a true north indication, a directive force without variation or deviation (Fig. 34-B).

This same principle will be found to hold true if one tries to pick up a wheel by lifting one end of its axle. When the wheel is standing still it will merely turn over. But if the wheel is spun rapidly, then lifted by one end of its axle, the wheel remains upright while the axle starts to turn (precess) to the right or left, depending upon the direction of spin. Here the couple, supplied by the lifting and the force of gravity, causes the axle of the wheel to precess right or left horizontally instead of up and down vertically as when the wheel is not spinning.

There is one very significant feature of gyroscopic physics which should be pointed out at this time. We stated that an atom floating freely in space would tend to establish its axes in a universal position which would be maintained so long as the atom remained in space. But when this atom falls to earth it loses its universal position and takes on a finite position in relation to the earth, one of its axes being affected by the force of gravity, another by the rotating motion of the earth, and a third through the act of precession because the third axis has to line

intersection of the equator and the elliptic, the course which the earth takes as it travels around the sun. The fundamental law being that the mean celestial poles move at right angles to a circle joining them to the poles of the elliptics. As a result of this discovery, it was possible to determine the motions of stars and planets.

The phenomenon of precession is explained in the following excerpt:

> If in the case of the universally mounted Gyro wheel, a pressure is applied to the frame of the wheel tending to change the direction of the axis, the pressure will not only be resisted, but the axle of the Gyro will move about an axis perpendicular to the one about which the pressure is being applied. This characteristic is known as precession (Fig. 33).

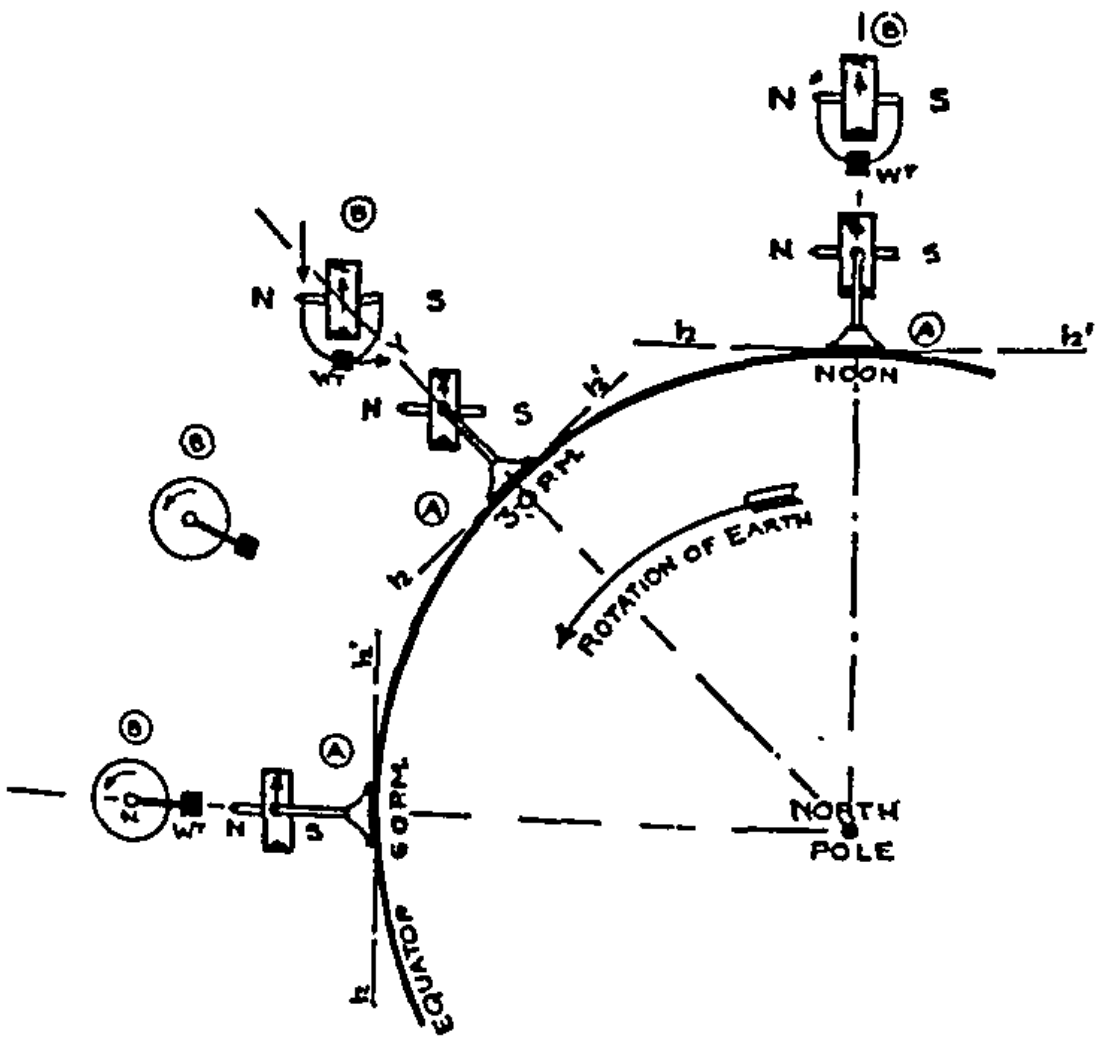


Fig. 34

orthogonal axes except that the frame of the gyro would be established differently for each position. In the one established at the twelve o'clock position the outside gimbals would be horizontal; while for the one established at the six o'clock position the inside gimbals would be horizontal.

The axis horizontal to the earth is the one which will be affected by the force of gravity. We will designate this axis as the (y — y) axis, subject to the force of gravity (the axis of vibration), in contrast to the other gimbal which functions as a top, vertical to the earth (z — z), (the axis of rotation). The position of these axes will become more and more important as we proceed with this study.

Ross explains precession as follows:

> A rotating body, whose center of gravity coincides with its point of support, develops the property of keeping its axis of rotation stable in space in accordance with Newton's 1st law (i.e.) If a body moves along any curved path whatever, it does so under the compulsion of unbalanced external force. Now the earth rotates in space around its own axis. Hence, the force of gravity affects bodies.
>
> The forces of gravity, friction, etc. are sufficient to make a non-rotating body change the direction of its motion through space in accordance with the motion of the earth; they are not, however, necessarily sufficient to exert the same effect on a rotating body. In the first case the motion is due to the earth; in the second it has a certain amount of independent rotating motion which it tends to retain in a constant direction in space, regardless of the changes which the earth's motion tries to impress upon it.

LAWS OF PRECESSION

According to the laws of momentum, there can be no change in the angular momentum of a body unless the body is subject to a torque which acts in the same direction as the change of momentum. The generation of angular momentum about a vertical axis as indicated by the change in momentum about Axis ZZ (Fig. 29, p. 32) would seem therefore to be a contradiction to this law, for there is no torque acting about a vertical axis.

itself up orthogonally with the other two axes of vibration and rotation.

Because of this, the time of day at which the atom becomes stabilized becomes a very important factor.

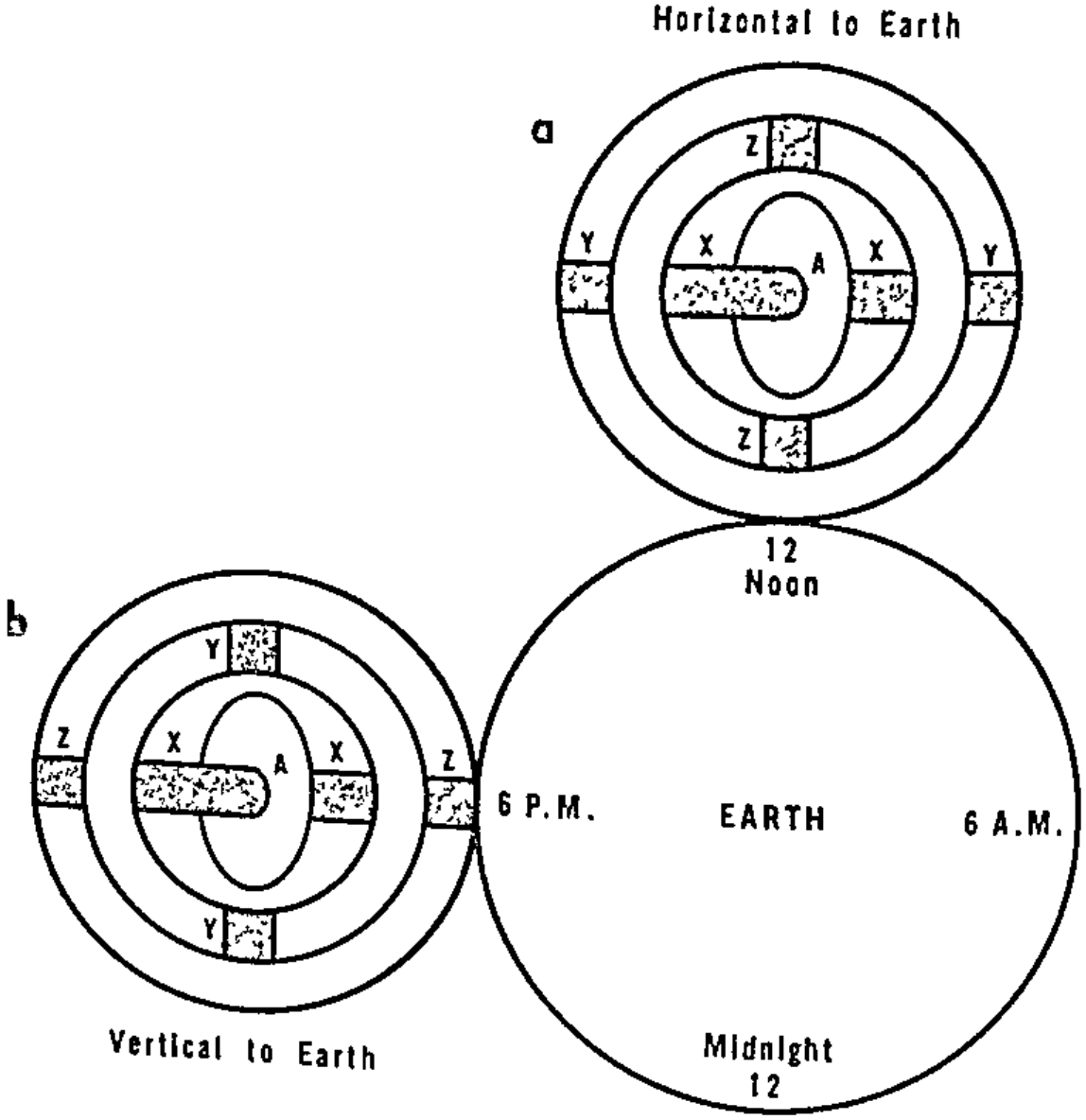


Fig. 35

The wheel (Fig. 35-a) may be presumed to be an atom existing in space. Now if this atom becomes stabilized on earth at the twelve o'clock position, its axis will be horizontal to the surface of the earth. If, however, it strikes the earth at the six o'clock position, its axis will be vertical to the earth.

Actually this would make little difference in a gyro with three

ing. It is through the directions of the axes of motion that the equations for energy and the creation of energy acquire their dimensionality.

Precession is one of the most profound and dynamic realities of nature. The law of precession is the law of direction governing the laws of the directions of motions; the laws of the directions of position; and the laws of the senses of directions. Precession is manifested through a change either to the orthogonal or rectilinear, bringing about a change in the direction of motion to direction of position, or a change in the sense of direction. It is made manifest in the thermal qualities of energy, in the mechanical or material properties of energy; and in the sensible qualities of energy.

Precession not only determines the directions of the magnetic and gyro compasses, but it also determines the directions of motion of an electric motor, the power of steam and gasoline engines, and the actions of atoms and molecules in the creation and transformations of various forms of energy. Every form of energy possesses not only the dimensions of space and the dimensions of time, but it must also possess the dimensions of precession or sense through which time and space are co-ordinated and made to function as sensible bodies and sensible forms of energy.

It is the change in direction of a force to the perpendicular which brings about a change in its nature; from a waterfall to mechanical energy; from mechanical energy to electrical energy; from electrical energy to mechanical energy; from mechanical energy to the chemical energy of heat (perhaps due to friction); from electrical energy to the chemical energy of light and heat.

Every form of energy has to have three axial components functioning perpendicularly to each other to exist as creative energy. If for any reason the alignment of these axes is changed, the form or the force of the energy will be changed.

The sense of direction, made manifest through "Precession" is neither spatial (not dependent upon the size or weight of the precessing body), nor is it entirely temporal (dependent upon the rate of speed of the precessing body), although the rate of

But immediately the torque (T) begins to turn the wheel about axis (YY), it also begins to generate angular momentum about that axis, this angular momentum about (YY) combines with the angular momentum of spin causing the axis of the wheel to precess about the vertical axis (ZZ).

Once precession has been started and is proceeding uniformly, the momentum generated by the torque (T) does not increase the total momentum possessed by the wheel, it simply changes the direction of that momentum, just as linear momentum generated by centripetal force (radius vector) does not increase the momentum of a body traveling in a circle, but merely changes the direction of that momentum Centripetal force generates linear momentum but does no work Precessional torque generates angular momentum but does no work

Newton's 1st Law "Every body continues in a state of rest, or of uniform motion in a straight line, except in so far as it is compelled by external forces to change that state"

P Shuchilovski (1924) commenting on this, states

> This law which is based on experience and, therefore, incapable of direct formal proof, might, for present purposes, be stated as follows If any body moves along any curved path whatever, it does so under the compulsion of unbalanced external forces"
>
> The angular velocity of precession of the axis of a gyroscope, due to its own eccentricity, does not depend upon the weight of the gyroscopic wheel, two similar wheels of different weights precess at exactly the same rate of speed, but a hollow top precesses more slowly than a solid one, its radius of gyration being greater
>
> The ratio between size, eccentricity, speed and disposition of material are the same in two gyros, the one small and the other large, they will precess at the same rate of speed"

THE IMPORTANT THING TO KEEP IN MIND ABOUT THE GYRO COMPASS IS NOT SO MUCH THE INSTRUMENT ITSELF, BUT THE AXES WHICH ENABLE THE COMPASS TO FUNCTION TRULY

With an understanding of the laws of precession and the directions of the axes of universal motion, the laws of physics, mathematics, and creative energy begin to take on new mean-

speed does have some effect upon the manner in which precession takes effect. Precession is purely a sense quality of energy brought into being through the orthogonality of the axes of motion. It is a sense quality which is neither spatial nor temporal.

"Precession" introduces a new coordinate into the space-time manifold. It introduces the coordinate "Sense," which is purely a "Sense of Direction." It puts direction alongside the other two co-ordinates, time and space, making the manifold, not a manifold simply of space-time, but a manifold of space-time-direction, or space-time-sense, the terms direction and sense being synonymous.

CHAPTER III

SENSE AND SENSITIVITY IN NATURE

THE OLD-FASHIONED grandfather's clock derived its energy from weights which utilize the energy of the pull of gravity. The new-fashioned electric clock derives its energy from an electric motor. Spring clocks derive their energy from the inward and outward motion of a steel spring which causes axial rotation. The rotation of the axis in one direction causes an inward tension, in the opposite direction an outward force.

This action of the steel spring in the clock is so common that people fail to realize that there is any inward or outward motion involved; it is considered natural that when the clock is wound it functions, and when unwound it stops. The inward and outward motion of the springs produces the rotating motion which enables the clock to function.

The force which supplies the energy to a spring is similar to the force which supplies the energy to a waterfall or steam engine. The force of a waterfall is supplied by the inward pull of gravity; while the force of a steam engine is supplied by the outward expansion of water vapor.

The winding of the clock spring is an inward force which holds energy encased until released through expansion. If permitted freedom of motion, the spring would fly out almost instantaneously, but it is attached to an axle whose speed of rotation is controlled by a hairspring which expands and contracts.

It is the inward and outward contraction and expansion of the hairspring which controls the time element of the clock As the hairspring expands, its axle, which is attached to a lever, turns in one direction, as it contracts, the axle turns in the opposite direction, releasing the lever It is the winding and unwinding, contraction and expansion of the hairspring which controls the tempo of the energy of the clock

The outward expansion of the mainspring supplies the force which enables the hands of the clock to move, while the inward and outward contraction and expansion of the hairspring control the rate of speed

The cell has been divided into molecules, the molecules into atoms, the atoms have been split into protons and electrons, then neutrons and positrons were discovered and neutrinos were introduced to differentiate electrons

When the problem is condensed down to its simplest fundamentals, it may be found that the protons serve as springs of force consolidated about one or more axes which serve as axes of centripetal vibration to hold together the protons and neutrons, or whatever name we wish to give to the particles of matter, while the electrons, with their axes of centrifugal rotation, serve as the temporal regulator of the atom, to control the velocity and thermal qualities, and draw the energies of the atom out into space The axes themselves serve as axles with levers and gears to co-ordinate and regulate the spatial, temporal and directional co-ordinates of energy

Arnold Sommerfield, in his "Atomic Structure and Spectral Lines," states

> The theory of atomicity of matter has existed ever since there was a science of chemistry, it is indispensable if the fundamental chemical law, that of multiple proportions, is to be intelligible A necessary consequence of the atomicity of matter is the atomicity of electricity
>
> We know from the specific heat of gases that the rotational degrees of freedom (and also the translational degrees of freedom) are all in full action at normal temperatures but that the vibrational degrees of freedom do not make themselves observed in the

case of the simpler gases From this we conclude that the rotational component of the motion is always present to a considerable degree but that the vibrational component is often not excited into action, and occurs only when energy is absorbed

More generally we shall assume that the change in the rotational energy is associated with a change of configuration of the molecule, no matter whether it consists in a rearrangement of the electrons, as Schwarzchild had already assumed when dealing with visible spectra, or in a sudden change in the oscillatory state, as we must now assume for the infra red spectra, or, finally, as we shall assume later, in the simultaneous occurrence of both processes

Like the rotations, the oscillations are divided into quanta

The special position occupied by *negative electricity,** its occurrence as pure atoms of electricity, calls for a special name Following the example of Stoney, we shall call the negative atom of electricity the *electron* On the other hand, we shall follow Rutherford in calling the smallest *positive ion*, namely the hydrogen ion, the *proton*, in spite of its being burdened with the mass of the hydrogen atom it plays the part of the atom of *positive electricity*

A great gap divides the electronic mass, as regards its magnitude, from the ordinary masses of atoms and ions The electronic mass is about 1800 times as small as the mass of the lightest atom

From this we conclude the electron is a universal element of structure of all matter An electron is, like every *negative* charge, essentially nothing more than a place at which the electric lines of force from *all directions* end In the case of an electron at rest, these lines of force are *straight lines* that come in uniformly from *all directions* But the same picture holds, according to the idea of the theory of relativity, for an electron moving in *any way* whatsoever, so long as the picture of the lines of force is regarded as being conceived by an observer *moving with the electron*, that is if the lines of force are drawn in a space that participates in the motion of the electron In other cases, when the electron moves with *regard to the observer* who is mapping out its field, the electric lines of force would still, indeed be *straight lines*, but would be *compressed toward* the central plane which is *perpendicular* to the *direction of motion*, and, moreover, would be *accompanied* by magnetic lines of force

From the point of view of our present ideas, it is better to refrain from endeavoring to give the electron a definite volume or size This could be calculated only on the assumption that the

* The terms referring to direction are italicized

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>
> We know from the specific heat of gases that the rotational degrees of freedom (and also the translational degrees of freedom) are all in full action at normal temperatures but that the vibrational degrees of freedom do not make themselves observed in the

The electron is more than a unit of electricity—it is one of the co-ordinates, not only of electrical energy, but also of chemical, physical and radio-active energy. It is the coordinate which gives energy a sense of direction, which in turn makes possible the sensitivity, uniformity, form and continuity of every form of energy.

Direction plays an important part not only in the creation of electrical and magnetic energy but it also plays an important part on all other forms of energy.

Alfred Daniell states:

> While somewhat has been learned as to the properties of matter, its essential nature is quite unknown to us. As a provisional statement we may say that Energy is the Power of doing work; a rifle bullet in motion, a coiled watch spring, possess the power of doing work upon bodies *suitably arranged;* but plainly this power depends upon the *relation* into which the matter which is said to possess it is brought *with reference to other matter,* and it ultimately depends upon the *position* of one set of particles *with reference to another set.* Since Energy depends, then, upon the *relative position of particles,* we are not able to explain its own essential nature, though we may be able to acquire considerable information as to its remarkable properties.
>
> These properties of Energy, those of Matter, their *mutual relations,* and the laws of these properties and *relations,* constitute the subject-matter of Natural Philosophy; and these have been ascertained by *observation,* by measurement, and by *judicious reasoning* upon the data supplied by investigation.

Herman T. Briscoe states:

> Many attempts have been made to visualize the parts of the atom and their relations to the structure as a whole. Some of these theories assign each electron (negative charge) a *fixed position* in space with respect to other electrons and with respect to the positive charge, which is thought to be concentrated in a small amount of space, called the nucleus, at the center of the atom. This nucleus contains both protons and electrons, but the former are always in excess of the latter; hence, the nucleus of every atom carries a positive charge. Other theories picture the electron rotating in an orbit around the nucleus. Considered in this light, the

whole mass effect is electro magnetic in origin, and this assumption is, on account of the necessity for a cohesive energy, not justified Moreover, we should be compelled in this case to make the arbi trary assumption that the electronic charge occupies uniformly either the volume or the surface of a sphere, for which there is no support in our experience Nevertheless, it is worthy to remark that in whatever way the detailed calculation is carried out we arrive at a sub atomic value for the extent of the electron, its diameter comes out to about 100,000 times smaller than that of an ordinary atom

The picture of the proton shows itself to be quite similar to that of the electron As the *lines of force start out* from positive charges, that are to be furnished with *arrows* in the *reverse direction* to that for electrons, they are likewise rectilinear and uniformly distributed, if we here also suppose the *observer* to be at rest *relatively* to the proton

All these things concern a pronounced external property to the atom, namely, its claim to space Its connection with valency con ditions and the structure of the periodic system in Lother Meyer's *curve* shows chemical actions, too, depend upon external properties of the atom In actual fact, they regulate the external relations of atoms to one another and themselves depend upon the *number* and *arrangement* of the external electrons that determine the valance Also the elastic properties of atoms, their thermal behavior as shown by Dulong and Petit's law of specific heats and the electrical conductivity each give a *curve* analogous to that given by atomic volumes, and thereby prove that they too are external properties of the atom

All through this most enlightening book Sommerfield refers to *direction* and, treats *direction* as a part of the force of energy The physicist recognizes that force and velocity have *direction* but should he not treat *direction* as one of the important co ordinates of energy in its own right?

Sommerfield has gone to quite some length to explain the physical and electrical properties of the electron The electron was the first unit of electrical energy segregated from the atomic mass This led to the discovery of the neutron, then the positron was discovered and now we are informed that a negative proton has been discovered

somewhat greater than the theoretical value indicates the presence of this *rotational vibration*

On approaching the melting point of the substance, the amplitude of this vibration attains such a value that the rotational vibration at last becomes a *continuous rotation* As soon as the rotational vibration is changed into a continuous rotation, the regular spacing of the atoms breaking down, disorder begins to ensue, and therefore the *rotation* becomes independent of the *translation* The atoms thus set free have now *two or three degrees of freedom of rotation* The angular velocity of each component rotation increases to such an extent that its energy becomes equal to that corresponding to *one degree of freedom of rotation* If all the atoms undergo the above change, the fusion is said to be complete, and the crystal changes to liquid

The above is more satisfactory from a physical point of view than the view proposed by Lindeman If the above view of fusion be correct, the *heat of fusion* consists mainly of the *energy of rotation* of the atoms gained during the process of fusion, the potential energy of atoms due to the small expansion of the volume during fusion, fusion being comparatively small

Since in *solids* the motion of each atom is *vibration*, but not *translation* as in the case of gases, its total energy is just twice the mean kinetic energy during a complete period of vibration

This gives quite a clear picture of the atomic action of fusion but it does not explain why in their solid state the atoms should vibrate while in their liquid state they rotate It would appear from this that when atoms acquire electrons, they acquire a rotating or spinning motion and that when they lose these electrons, they acquire a vibrating motion But these directions of motion must have some controlling medium which controls their motion and their direction of motion and the only means available for controlling this motion is through the axes of the protons and electrons, therefore it is natural to conclude that the motion of rotation is controlled and directed by the axes of the electrons, while the motion of vibration is controlled and directed by the axes of the protons

To explain what is meant by axes of protons and electrons, let us examine the molecular theory of magnetism which has

atom becomes a miniature 'solar system' with a nucleus for its sun and electrons for its planets

Helmholtz remarked

If we assume atoms of chemical elements, we can not escape from drawing the further inference that electricity, too, positive as well as negative, is divided into definite elementary quanta that behave like atoms of electricity Each ion, as long as it is moving in the liquid, must remain associated with an electrical equivalent for each of its valency units

As is well known, ions are the wandering constituents of electrolytes during electrolysis, the cat ion being the positively charged constituent which moves in the *direction* of the positive current, inward, the an ion being the negatively charged constituent which moves outward

We know positive electricity only as an ion, that is associated indissolubly with ordinary matter Negative electricity also presents itself with ordinary matter Negative electricity also presents it self in electrolysis in the form of ions But we also know the latter in its free state disassociated from all ordinary matter, as detached electricity, so to speak This is an all important result of the researches on cathode rays

Kotaro Honda, a Japanese scientist, in demonstrating the theory of the specific heats of liquids, states

According to the modern view, the atom has a very complicated structure so that it sends out lines of force chiefly in certain definite *directions* and hence the regular spacing of the atoms in solids is only possible for their definite orientation—that is in solid substance free rotation of the atoms is not possible This view is confirmed by the determination of the specific heat of solid substance Thus each atom of a solid *vibrates* about its mean position *with three degrees of freedom*

We may also with good reason suppose that with the above mode of *rectilinear vibration* the atoms are associated with small dependent *rotational vibrations* about their centers of mass, probably with a common period of vibrations At the ordinary tem peratures this mode of *rotational vibration* is very small, but as the temperature rises, it increases at a steady rate The fact that at very high temperatures the specific heat experimentally found is

J J Thompson has demonstrated the existence under many different conditions of particles more minute than anything previously shown to science The particles which Thompson termed corpuscles are more commonly known today as electrons If an atom loses an electron it becomes *positively* electrified, if it receives additional electrons it is *negatively* electrified

The process of electric conduction in metals consists in the movement of the detached electrons, and many other phenomena, both electrical and thermal, can be more or less completely explained by this agency It has been supposed that certain electrons *revolve* like satellites in orbits around the atoms with which they are associated, a view which receives strong support from the Zeeman effect, and on this assumption a theory has been worked out by P Longevin, which accounts for many of the observed facts of magnetism

As a consequnce of the structure of a molecule, which is an aggregate of atoms, the *planes* of the orbits of an electron around an atom may be orientated in *various positions*, and the *direction* of revolution may be right handed or left handed with respect to the *direction* of any applied magnetic field

For those orbits whose projection upon a plane *perpendicular* to the field is *right handed* the period of revolution will be accelerated by the field (since the electric current is *negative*) and the magnetic moment consequently increased, for those which are *left handed*, the period will be retarded and the moment diminished The effect of the field upon the speed of the revolving electrons, and therefore upon the moments of the equivalent magnets, is necessarily a very small one

If the *structure* of the molecule is so perfectly *symmetrical* that, in the absence of any external field, the resultant *magnetic moment* of the circulating electrons is zero, then the application of a field, by accelerating the right handed (*negative*) revolutions, and retarding the left handed (*positive*) revolutions, will induce in the substance a resultant magnetization *perpendicular in direction* to the field itself, a body composed of such symmetrical molecules is therefore *diamagnetic* If, however, the structure of the molecule is such that the electrons revolving around its atoms do not exactly cancel one another's efforts, the molecule constitutes a little magnet, which under the influence of an external field will tend to set itself with its *axis parallel to the field*

Ordinarily, a substance composed of asymmetrical molecules is *paramagnetic*, but if the elementary magnets are so conditioned by

been generally accepted as scientifically true Perhaps this will throw some light on the manner in which these axes function

According to W E Weber's theory,

> The molecules of a ferro-magnetic metal are small permanent magnets, the *axes* of which under ordinary conditions are *turned indifferently in every direction*, so that no magnetic *polarity* is exhibited by the metal as a whole, a magnetic force acting upon the metal tends to *turn the axes* of the little magnets *in one direction*, and thus the entire piece acquires the *polarity* of a magnet
>
> If, however, the molecules could *turn with perfect freedom*, it is clear that the smallest magnetizing force would be sufficient to develop the highest possible degree of magnetization which is, of course, not the case Weber, therefore, supposed each molecule to be acted on by a force tending to *preserve* it in its *original direction*, the position actually assumed by the axis being in the *direction* of the resultant of this hypothetical force and the applied magnetic force
>
> Maxwell, recognizing that the theory in this form gave no account of *residual magnetization*, made the further assumption that if the *deflection* of the axis of the molecule exceeds a *certain angle* the axis would not return to its original position when the deflecting force was removed but would retain a *permanent set* Although the amended theory, as worked out by Maxwell, is in rough agreement with certain leading phenomena of magnetization, it fails to account for many others and is, in some cases, at variance with observed facts
>
> Magnetism is essentially a molecular phenomenon If a current *circulates* in a small plane circuit the magnetic action of the circuit for the distant points is equivalent to that of a magnet whose *axis is perpendicular* to the plane of the circuit and whose *moment* is the *direction* of the magnetization being related to that of the *circulating current* as the thrust of a right handed screw to its rotation
>
> There is strong reason for believing that *magnetism* is a phenomenon *involving rotation*
>
> It was shown by Roland (1876) that a *revolving electric charge* produces the same magnetic effect as a current Since that date it has more than once been suggested that the molecular currents producing magnetism might be due to the *revolution* of one or more of the charged atoms or ions constituting the molecule

may be completely masked by the superposed *paramagnetic* or *ferro-magnetic* condition

Diamagnetism, in short, is an atomic phenomenon, *paramagnetism* and *ferromagnetism* are molecular phenomena Hence may be deduced an explanation of the fact that, while susceptibility of all known *diamagnetics* (except bismuth and antimony) is independent of the temperature, that of paramagnetics varies inversely as the absolute temperature, in accordance with the laws of Curie

Science deals with few absolutes One is absolute zero —273 16 centigrade At this temperature the action called heat is wholly stilled Close to this point of death still cold matter acts in strange ways Liquid helium climbs out of containers, the electrical resistance of metals disappears

Dr John F Allen of St Andrews University, Scotland, explains certain methods of attempting to reach absolute zero

> The common method of creating cold—compressing and expanding gasses—works only as far down as about one degree above absolute zero So the scientists turned to a cold-creating method based on the fact that atoms in certain crystalline salts act like little magnets
>
> Normally the atoms point every which way, but when the crystals are placed in a strong magnetic field, they line up in one direction The lining up process warms the crystals slightly Then the magnetic field is removed The atom magnets point at random again, and the crystals get colder than they were at the start This method works fine down to about two-thousands of one degree above absolute zero
>
> At this point the scientists use the magnetic properties of atomic nuclei When certain materials (e g , lithium fluoride) are placed in a strong magnetic field, the nuclei of their atoms also line up When the magnetism is removed, the lithium fluoride gets colder This method promises to yield a temperature only one-millionth of a degree above absolute zero
>
> At such profound cold the molecules will be almost deathly still Zero itself will not have been reached It is a will-o' the-wisp game that the physicists play zero can be pursued and approached, but never actually captured

The most amazing aspect of the whole "Molecular Theory of

their strength and concentration that mutual action between them is possible, the substance is *ferro-magnetic*. (Fig 36)

In all cases, however, it is the *diamagnetic* condition that is initially set up—even iron is *diamagnetic*—though the diamagnetism

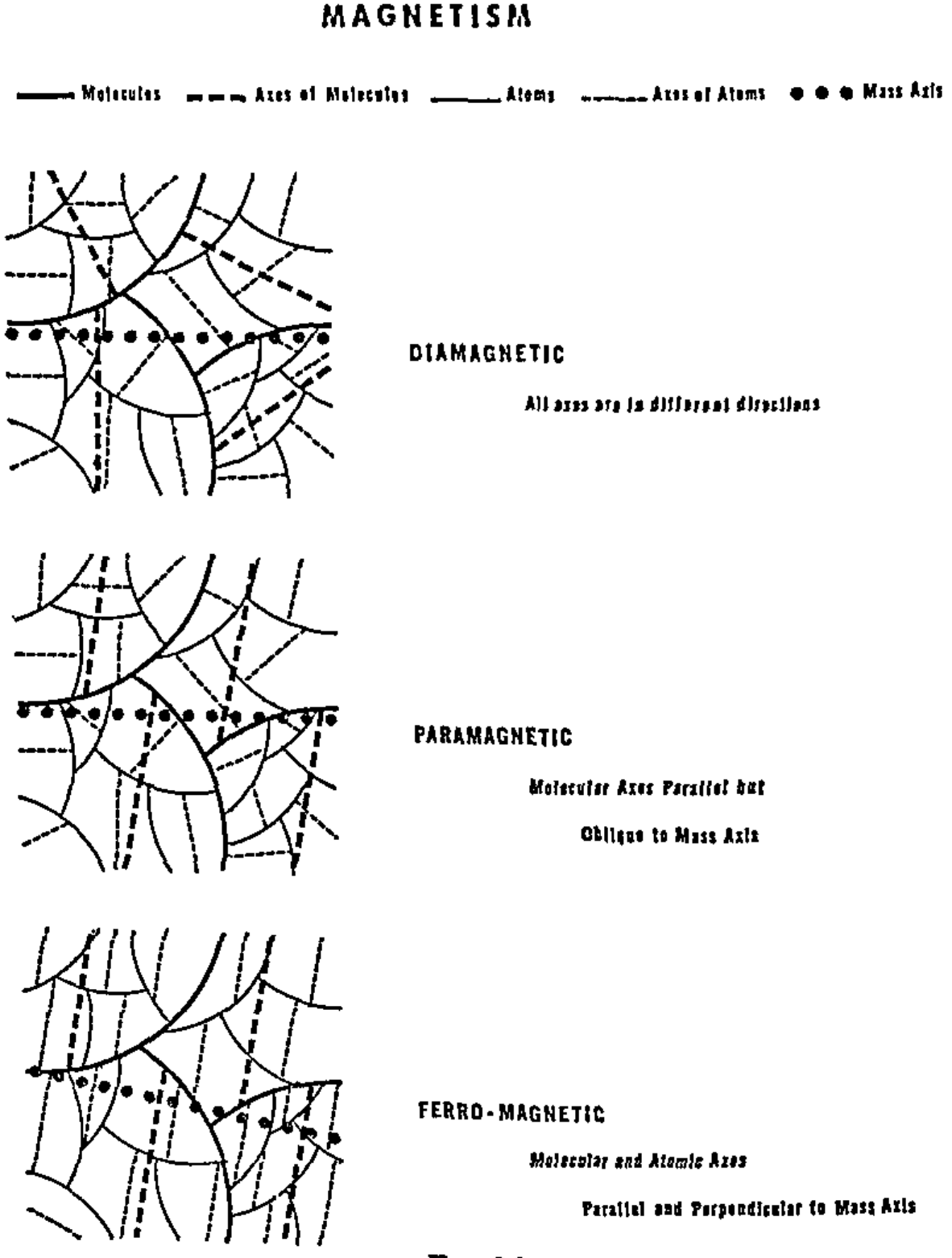

Fig 36

may be completely masked by the superposed *paramagnetic* or *ferro-magnetic* condition

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The most amazing aspect of the whole "Molecular Theory of

Magnetism" is the fact that nearly all scientists agree that atoms and molecules possess axes, and that these axes change their direction under the influence of different stimuli, yet where else are the axes of molecular and atomic energy given due consideration?

In the above extracts an explanation is given for the direction of a magnetic flux with the assumption that molecules of ferro magnetic metals are small permanent magnets, and that diamagnetism is an atomic phenomenon, while paramagnetism and ferromagnetism are molceular phenomena

The question we should like to have answered is, how and where do atoms and molecules acquire these axes?

THESE AXES SERVE AS CO-ORDINATING PARTS OF EVERY FORM OF ENERGY THEY ARE PRESENT IN EVERY PART OF EACH ATOM EVERY PROTON AND ELECTRON HAS AN AXIS ABOUT WHICH IT FUNCTIONS IT IS THE AXES OF THE PROTONS AND ELECTRONS AND THEIR ALIGNMENT TO EACH OTHER WHICH DETERMINES THE KIND AND CHARACTER OF EVERY FORM OF ENERGY

In accord with the molecular theory of magnetism, let us assume that all atoms, molecules, masses and other forms of energy have axes which serve as axes of direction to supply the necessary sensitivity and dimensionality to enable matter and energy to form and perform consistently And not only do we assume that each particle and form of energy possesses such axes, but that they each possess three sets of such axes to enable them to display their particular characteristics under varying conditions

These three axes are 1) an axis of centripetal vibration about which a proton forms giving the proton an inward sense which we term positive, 2) an axis of centrifugal rotation about which the electrons form giving them an outward sense which we term negative, 3) an axis of precession, made up of the combination of the axes of centripetal vibration and centrifugal rotation, but which functions orthogonally to both of them and whose sense may be either negative or positive depending upon the form of

energy or matter created and the particular characteristics displayed

These axes to which we refer are not of themselves quanta, they are purely and simply senses of direction which direct and control the formation and actions of all forms of energy And not only do they control the formation and actions of all forms of energy, but they also enable each form of energy to display its particular characteristics, move about from one place to an other without disturbing the medium through which it passes, and make itself known to the human mind

It is by means of precession that an electric current can be transported from place to place, light transmitted through space, heat through metals, without disturbing the elements through which they pass

Energy is transmitted throughout the world through the medium of precession This is how energy is passed along from atom to atom, molecule to molecule, mass to mass, and space to space If it were not for the medium of precession through which different forms of energy are transported from place to place without disturbing the elements or the space through which these forms of energy pass, there could be no light, heat, gravity or electrical energy transmitted through the world

Transmission by precession is a method whereby the axes of the form of energy at (A), (Fig 37) are transferred over and

Transmission By Precession

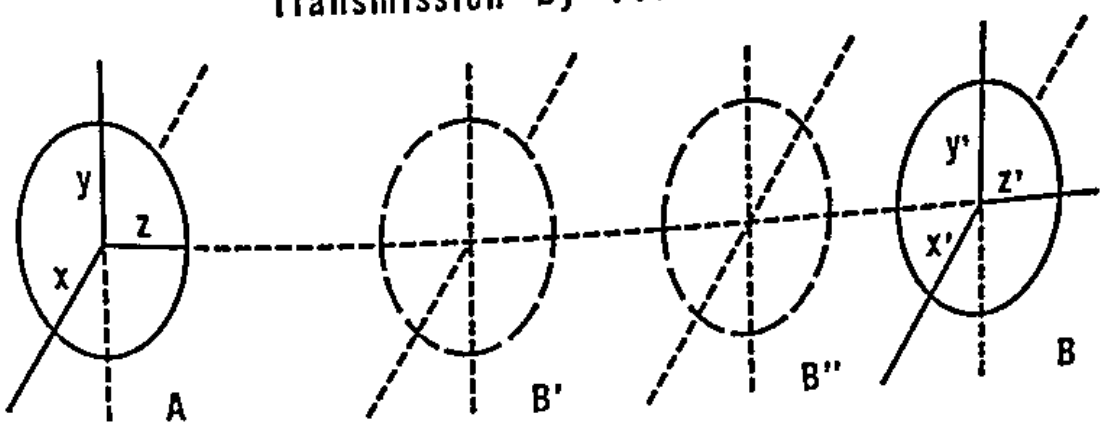


Fig 37

set up as similar forms of energy at (B) The senses of direction of the axes at (B) (x′, y′, z′) are made to conform to the senses of direction of the axes at (A) (x, y, z), the same axes being set up along the path at (B′) and (B″)

Transmission by precession is a method whereby different forms of energy are transmitted from place to place, through liquids, solids, the atmosphere and supposedly empty space without any apparent motion or disturbance to the medium through which the energy passes

DEMONSTRATION OF TRANSMISSION BY PRECESSION

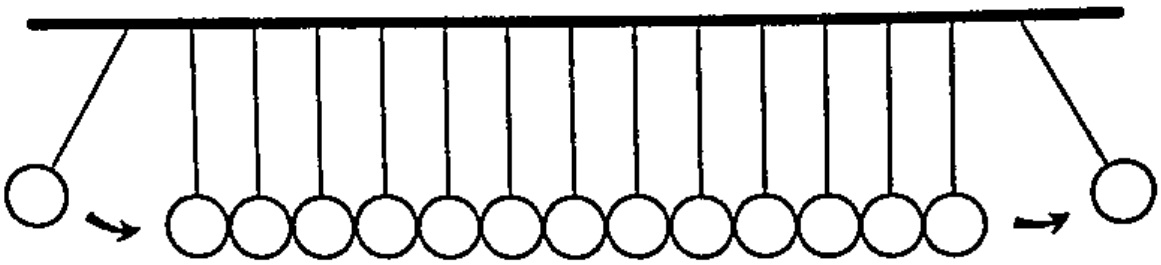
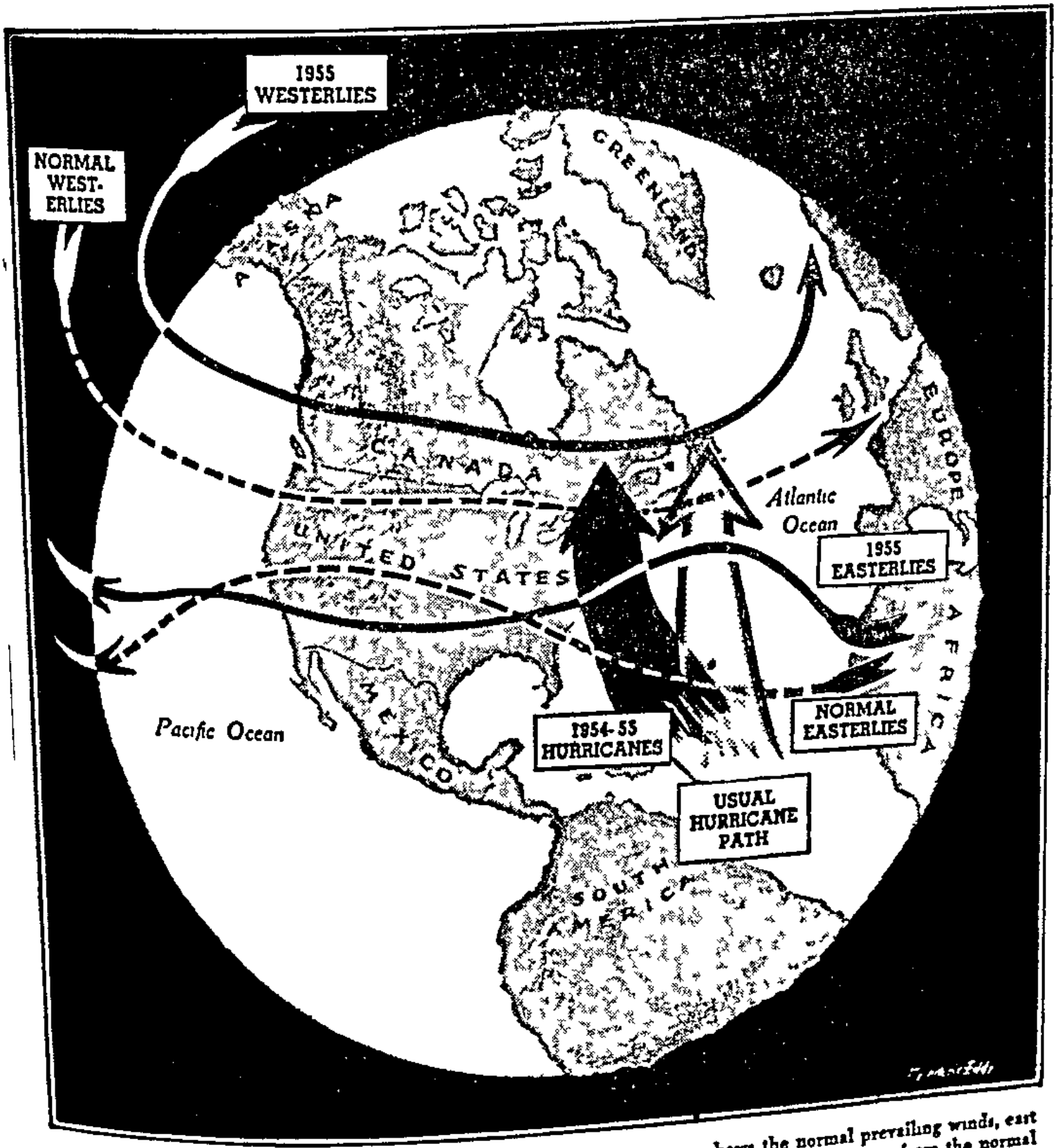


Fig 37a

Transmission by precession may be visualized more clearly by observing what takes place when a number of solid balls hung from strings on a pole, with each ball touching the balls on either side of it, are struck by a force If the first ball is swung so as to strike the ball next to it squarely, nothing happens to the next ball, or any of the balls along the line until the energy is transmitted to the last ball which is sent flying The energy passes through each of the balls, but nothing happens to them, they just transmit the energy through the medium of precession (Fig 37a)

A similar act of precession takes place in an electric wire when an electric current passes through it There are no apparent changes in the atoms and molecules of the wire as the current passes through, only a change in their sense, from their normal chemical sense to an electrical sense If the current is weak, only a few of the axes of the molecules are changed If the current is strong, many of the axes in the wire are altered to conform



The map, based upon information supplied by the U S Weather Bureau, shows the normal prevailing winds, east and west, that sweep the United States during the summer months. Also shown are the deviations from the normal paths that occurred last summer The westerlies, which tend to push East Coast hurricanes to sea, were farther north last summer, allowing the storms to sweep deeper inland. The easterlies, also farther north last summer, brought the storms closer to the coast.

Fig 38

to the current If the current is too strong for the atoms and molecules in the wire, the axes will be precessed from their original inward chemical sense to an outward chemical sense, causing the wire to melt or possibly ignite and burn up

Nature employs several methods for the creation and transmission of energy This is evidenced in the flowing of liquids, the blowing of wind and the motions of matter One of the most revealing examples of the laws of precession is brought to light through the actions of hurricanes

Ordinarily our trade winds travel across the earth in an easterly and westerly direction (Fig 38) setting up gentle breezes along their paths When these breezes become more active they change from horizontal wave motions to vertical rotations, setting up vertical axes of rotations along their paths If the rotations are clockwise they establish high pressure areas at the axis, if counter clockwise, they set up low pressure areas at the axes

During certain periods, especially the equinoxes, when the heat from the sun becomes very intense, the velocity of these rotations is tremendously increased, establishing what we term hurricanes Because of the intensity of their velocity, and the direction of the rotation of the earth, these vertical axes are precessed from their original easterly and westerly directions of motion to a northerly or southerly direction If the hurricane originates in the Northern Hemisphere it will travel north, if in the Southern Hemisphere, it will travel south

Hurricanes are a very good example of how the axes of nature control the forces of energy Anyone who has ever been in the center of a hurricane knows that there is nothing there to indicate that it is the center of such a terrific force There is no wind no activity, few clouds Everything appears very peaceful and calm, yet this is the axis which controls the momentum and direction of motion of the whole force of the hurricane

Another motion of nature is wave motion in which the particles rotate and move up and down as the waves are transported from place to place Wave motion, it was pointed out, is a combination of translations, vibrations and rotations

A third form of motion is radiant energy, where the energy is transported from place to place with no apparent change or motion of the particles of the medium through which the energy passes

Now, in the Molecular Theory of Magnetism, it was pointed out that molecules have axes which when lined up in a certain order acquire the polarity of a magnet The question is whether or not these axes are restricted to ferro-magnetic metals, or do all molecules and atoms possess axes which can be lined up in various positions in respect to each other to bring about certain electrical, chemical and sense reactions?

In the undulation theory of Roger Boscovich (1756) the whole mass of bodies is supposed to consist of an exceedingly great yet finite number of simple, indivisible, unextended atoms These atoms are endued by the Creator with *attractive* and *repulsive* forces which vary according to the distance

"The entire energy of a molecule of gas," says Boscovich, "is not measured by its momentum alone, but by this plus its energy of vibration and rotation

All through these and many other discussions concerning energy, direction is referred to and treated as a part of the force of energy Physicists recognize that force and velocity have direction, but how many attempts have been made to determine what direction is or how it is employed by nature for the creation of energy?

PRECESSION (A CHANGE IN THE SENSE OF DIRECTION) IS THE LOCKING AND UNLOCKING DEVICE NATURE EMPLOYS FOR SEALING ENERGY IN ITS POTENTIAL STATE, THEN, BY REVERSING THE SENSE OF DIRECTION, THIS ENERGY IS RELEASED AND TRANSMITTED AS KINETIC ENERGY

ENERGY

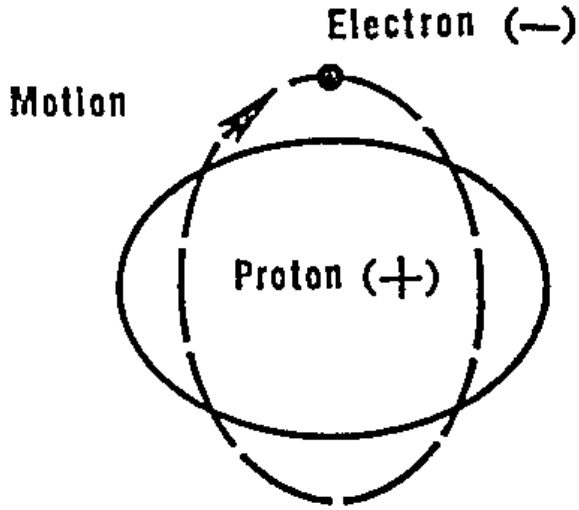


Fig. 39

The simplest atom, the hydrogen atom, is composed of a proton, an electron and a direction of motion of one or the other (Fig. 39). The proton, which makes up the body of the atom, is represented as an ellipse; the electron as a dot outside the ellipse; and the direction of motion of the electron by a broken line with an arrowhead to indicate the direction of motion.

Each proton and electron has to have its axis with an arrowhead to indicate its sense of direction, whether negative or posi-

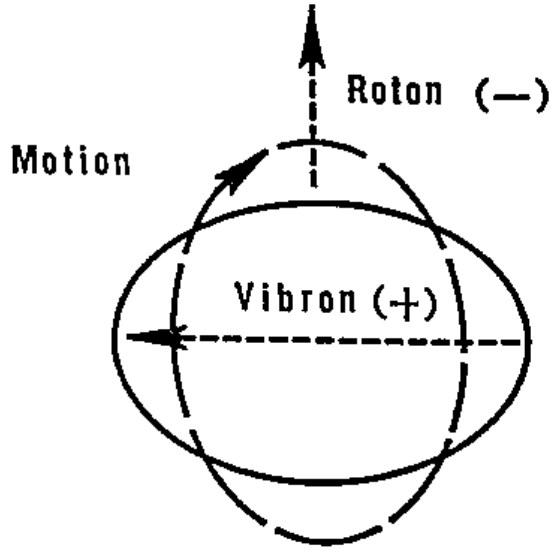


Fig. 40

tive, so we will give the proton its VIBRON, and the electron its ROTON (Fig. 40).

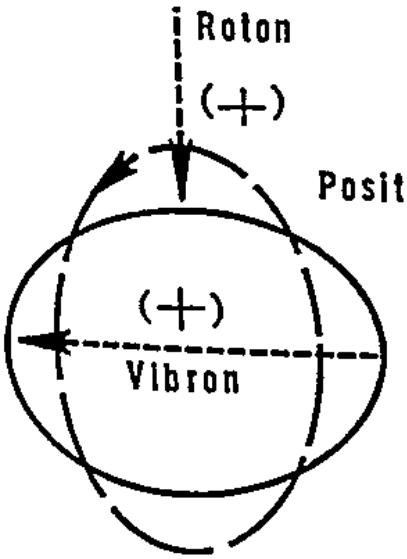


Fig. 41

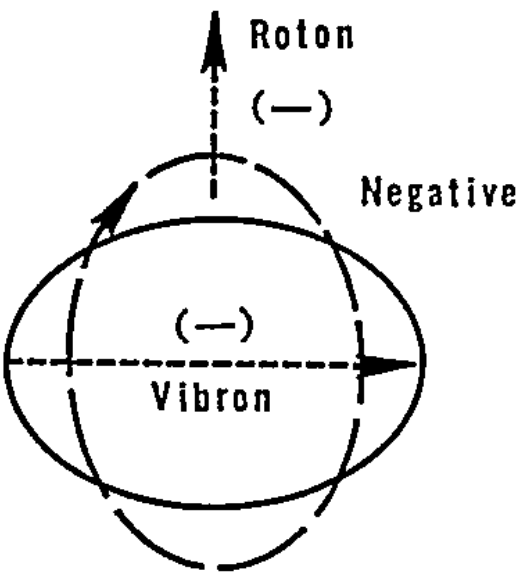
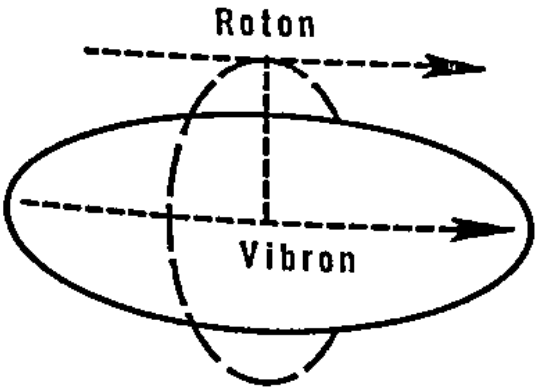


Fig. 42

The sense or the form of energy can be changed from positive to negative by reversing the arrowheads of the axes (Figs. 41, 42).

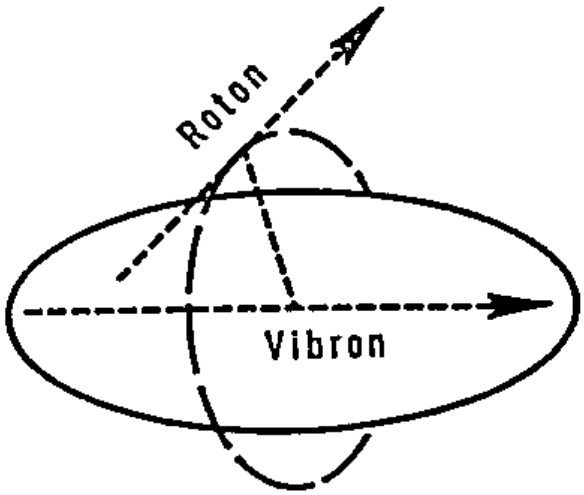
When the rotons and vibrons function vertically to each other, electrical energy is generated. When their sense is inward (Fig. 41), the electrical energy is positive; when outward (Fig. 42), the electrical energy is negative.

When the rotons and vibrons function parallel to each other (Fig. 43), chemical energy is generated.



CHEMICAL ENERGY

Fig. 43

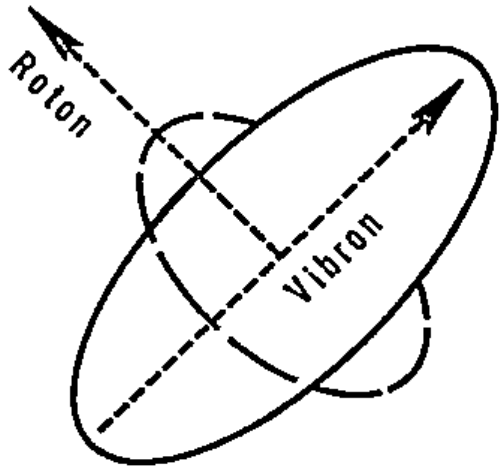


RADIO-ACTIVE ENERGY

Fig. 44

When the rotons and vibrons function perpendicularly to each other in separate planes, termed LATICAL (Fig. 44), radio-active energy is generated.

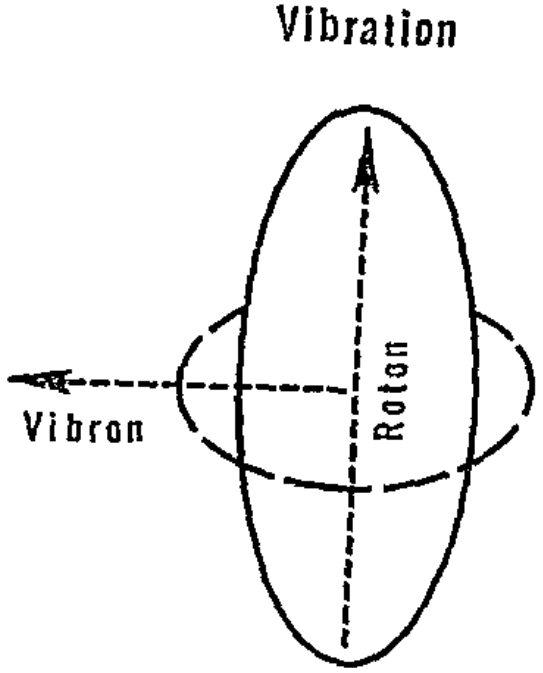
Rotation



MAGNETISM

Fig. 45

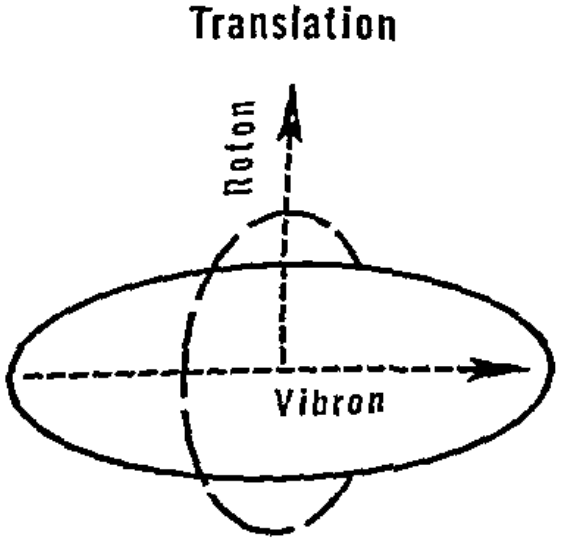
When the rotons rotate vertically to the vibrons, and they both are precessed to a universal axis of rotation, a magnetic force is induced (Fig. 45).



RADIO WAVES

Fig. 46

When vertical and precessed to a universal avis of translation and vibration, radio waves are created (Fig. 46).

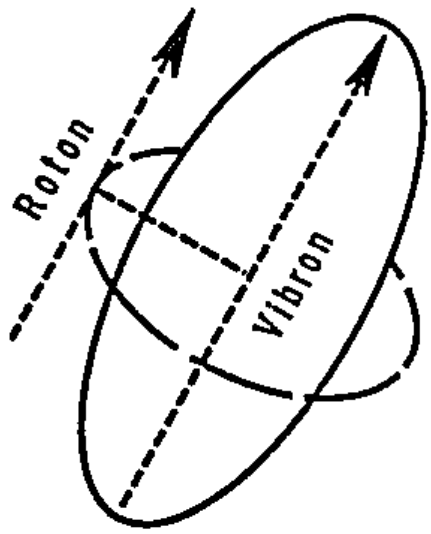


ELECTRIC CURRENTS

Fig. 47

When vertical and precessed to a universal axis of translation and rotation, electric currents are generated (Fig. 47).

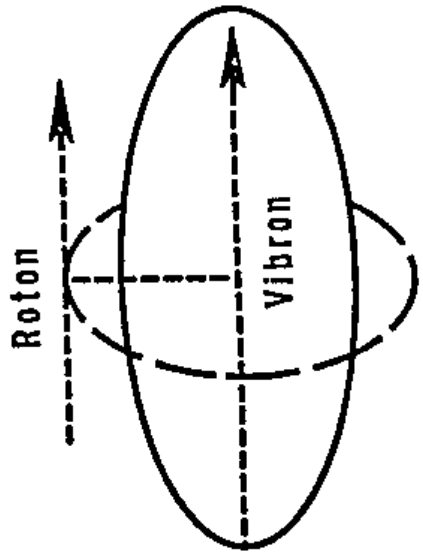
Rotation



HEAT
Fig. 48

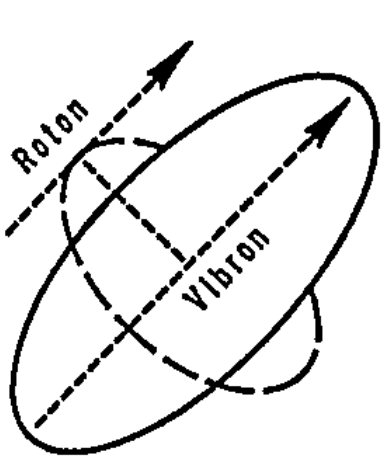
When, instead of being vertical, the rotons and vibrons are parallel to each other, chemical energy is generated, which, when precessed to a universal axis of rotation creates heat (Fig. 48).

Vibration



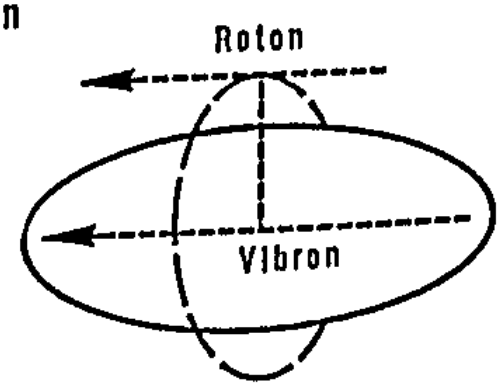
FLAME
Fig. 49

When parallel and precessed to a universal axis of translation and vibration, a flame is created (Fig. 49).



LIGHT

Fig. 50



GRAVITY

Fig. 51

When parallel and precessed to a universal axis of translation and spin, light is created (Fig. 50) when the sense is outward. The complement of light, with its inward sense of translation and vibration, is gravity (Fig. 51).

Gravity is an inward sense of vibration along a universal axis of translation. When the force of gravity is interrupted because of contact with matter, the vibrons are precessed from their universal axis of translation to a universal axis of vibration through which the vibrons adhere together to form matter.

Solidification is the lining up of the vibron axes of matter so that they are parallel with senses inward. At this moment the vibrons precess to the perpendicular of stabilization and join together to form a mass axis about which the mass consolidates (Fig. 52-4).

When the vibrons are precessed from their parallel alignment inward (Fig. 52-4), to a parallel alignment outward (Fig. 52-6), the vibrons separate from one another in the mass axis and function independently as molecular axes. This is termed melting.

When the vibrons are precessed from their universal axis of vibration to a universal axis of rotation, they separate from one another as axes of the molecules to form the axes of the atoms, enabling the atoms to function independently. This is termed vaporization or gasification (Fig. 52-7).

STABILIZATION & VAPORIZATION

1. Gravity

TRANSLATION

9. Light

2. Precipitation

ATOM — VAPOR

ROTATION

8. Ignition

ATOM — GAS

3. Condensation

MOLECULE LIQUID

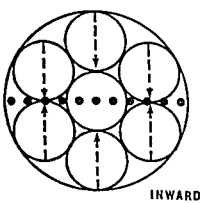
VIBRATION

7. Vaporization

MOLECULE LIQUID

4. Solidification

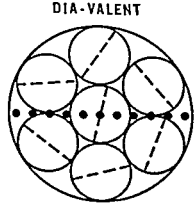
FREEZING



SOLID

5. Stabilization

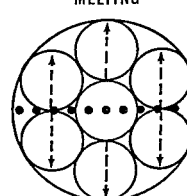
DIA-VALENT



SOLID

6. Liquificati·

MELTING



SOLID

Fig. 52

Precipitation and volatilization take place when the vibrons line up parallel to each other and are precessed to a universal axis of translation, precipitation taking place when the vibrons' senses are inward (Fig 52 2), volatilization taking place when they are outward (Fig 52 8)

Each different element has its own moments when it changes its state of consistency from a solid to a liquid, a gas, a vapor, and at which it ignites At each of these moments masses, molecules and atoms swing into action depending upon the stimulus If the stimulus is heat, the mass liquifies What this really means is that the axes of the molecules, which had been consolidated together to form a mass, have separated, each axis returning to its molecule, enabling each molecule to function independently in a liquid state

When an element vaporizes, the axes of the molecules separate into atomic axes, thus enabling each atom to function independently in its gaseous state

When matter ignites, the vibrons precess to the orthogonal of vibration, creating the flame and consolidating the energy into matter, while other vibrons, with their abundance of rotons, precess to the orthogonal of outward translation and spin creating the radiant energy of light Heat is the energy of light precessed to an axis of rotation Shade is the spinning rotons of light whose axis of translation has been precessed into heat

When the parallel vibrons and rotons of chemical energy combine under certain conditions with the vertical vibrons and rotons of electrical energy, the rotons are precessed to a latical position in relation to the vibrons creating radio-active energy

SUMMARY

The directions of the senses of energy
In electrical energy the vibrons and rotons are vertical
When the senses of the vibrons and rotons are inward, the electrical energy is positive, when outward, negative

Positive electrical currents are waves of electrical energy precessed to the orthogonals of inward translation and spin.

Negative electrical currents are the same waves precessed to the orthogonals of outward translation and spin.

Magnetism is a wave of electrical energy precessed to the orthogonal of rotation.

Radio-waves are waves of electrical energy precessed to the orthogonals of outward translation and vibration.

In chemical energy, the vibrons and rotons are parallel.

Light is a wave of centrifugal energy precessed to the orthogonals of translation and spin. Light itself is the spinning of the rotons, parallel to the vibrons.

Heat is the same energy precessed to the orthogonal of rotation.

Gravity is a wave of centripetal chemical energy precessed to the orthogonals of translation and vibration. Gravity itself is the vibrating, or pulsating, of the vibrons.

Solidification is the same energy precessed to an axis of vibration.

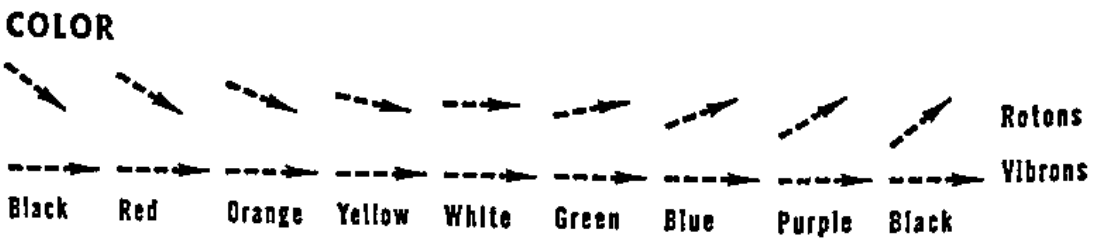


Fig. 53

The sense of color is brought about through the alignment of the rotons in relation to the vibrons (Fig. 53); when lined up parallel the sense of white light is created; when lined up with the sense of the rotons pointing inward toward the vibrons, the sense of color varies from yellow to orange, red, maroon and black, depending upon the degree of the angle; when lined up with the sense outward, the color varies from green to blue, purple and black, depending upon the angle.

Electrical energy with its rotons vertical to the vibrons creates no sense of color.

It is generally believed that color is associated with the wave lengths of the vibrons, and it is, but it is not the wave length of the vibrons which creates the color, color is purely a sense of direction Now it may be that the wave length of the vibrons has something to do with the angle of the position of the rotons in relation to the vibrons, but it is the position of the rotons in relation to the vibrons which creates the sense of color, not the wave lengths of the vibrons

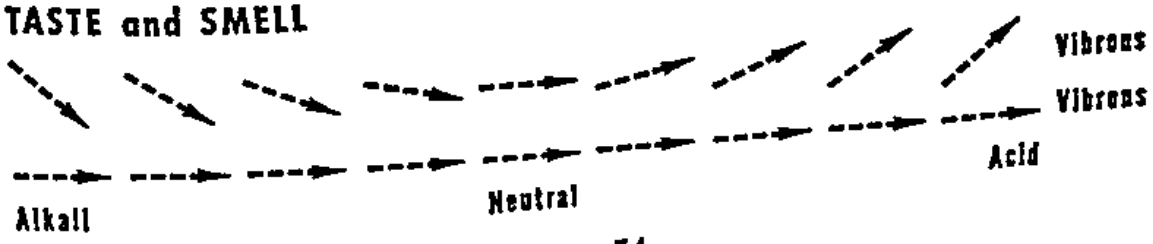


Fig 54

The senses of taste and smell are similar to the sense of color, the only difference being that whereas in the sense of color, it is the alignment of the rotons in relation to the vibrons that creates the color sense, in the senses of taste and smell, it is the alignment of the vibrons of the various molecules and atoms in relation to each other, that creates the senses of taste and smell, ranging from the alkalis whose sense is inward or positive, to the acids, whose sense is outward or negative (Fig 54)

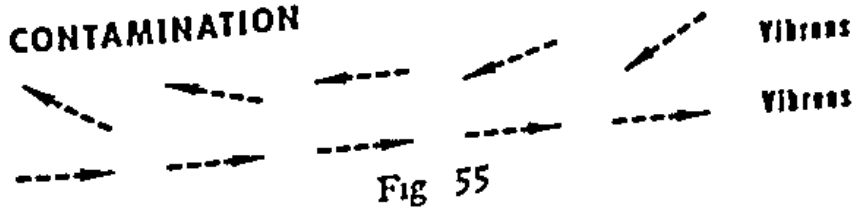


Fig 55

When the vibrons are lined up with their sense the same, the body is pure and healthy; but when some or all of the vibrons are precessed to the inverse, the body becomes contaminated causing a change in the taste and smell (Fig 55)

An interesting sequence of this reaction is that in the fall the leaves that have been green all summer turn to shades of yellow, orange and red, while when the red blood of animal life dies, it turns to shades of blues and green

The combining of equal positives and negatives in mathematics results in zero or nothing, but when the physicist combines positive and negative electrical or chemical energy his result is not zero, it is a change in the form of energy depending upon the directions and positions in which the vibrons and rotons are turned The mathematician has ways of designating these various forms of energy through his mathematical signs He is obliged however to rely upon experience and then, with the knowledge obtained from his experience he is enabled to appropriate certain signs and symbols to explain certain reactions Some day mathematicians may perfect a mathematics of direction to explain sensory reactions (This will be covered more extensively in Chapter VIII)

CHAPTER IV

THE ELEMENTS

In a recent article in the SCIENTIFIC AMERICAN, Robert E Marshak states

> The glue that holds the nucleus of the atom together is a mystery that defies all our experience and knowledge of the physical world It is a force so unlike any we know that we can hardly find words to describe it We do have a clue, however, to which we can give a name It is a pi meson, or pion In some way, not yet understood, pions are certainly involved in the nuclear binding force The mass of a pion is about 270 times that of an electron

After an extensive discourse on pi mesons and pions, he concludes

> The chief difficulty is the fact that we must deal with swarms of pions Our mathematical techniques cannot effectively handle more than one pion at a time Beyond this things become much too complicated The problem appears to be a basic one, and it seems that only some radically new idea will enable us to solve it And so the pion, while providing a tantalizing glimpse into nuclear forces, serves only to deepen our ignorance

Louis DeBroglie states

> During the last century, chemical discovery taught us that all chemical substances are derived from the combinations between certain 'simple substances," reaching the respectable number 92 Chemists were thus led to the assumption that each simple substance consists of so many atoms, each of them identical with all of the others Physicists adopted this view of the atom and constructed a number of theories (the most familiar being the Kinetic Theory of Gases) in which the atoms were cast for the part of

elementary corpuscles But it was impossible to halt at this point the scientific spirit in its craving for simplicity, could not remain satisfied at a stage where it has to operate with 92 different species of elementary corpuscles The experimental discovery that electricity has a corpuscular structure came at this point to simplify matters Experiments showed negative electricity to consist of corpuscles all of the same (extremely light) mass and electric charge—the electrons Since then it has been proved that positive electricity also has a similar corpuscular structure, the elementary corpuscles of positive electricity being the proton At this point physicists realized that the atoms of simple substances must not be taken to be elementary corpuscles, but were complicated structures formed of protons and electrons, there being 92 different types of structures—and 92 different kinds of atoms A great step had thus been taken towards a simple corpuscular Theory of Matter, since the two classes of corpuscles by themselves would suffice to account for the properties of Matter and to reduce the entire material Universe to a vast collection of protons and electrons If, further, it were to prove possible to find exact laws governing the motion of these corpuscles, then the Cartesian ideal of a description of the physical world in terms of figures and motion' would have been fulfilled, and simultaneously the demands of the doctrine of Universal Determination would have been met It looked as though physicists were on the point of reaching an ideal pursued for many years

John J O Neill, the late Science Editor of the NEW YORK HERALD TRIBUNE, stated

> All of the simple fundamental particles of matter out of which the scientists have been constructing their pictures of the atom and the universe may not be as simple or as fundamental as it has been believed When there were two such particles, the electron and the proton, the particle problem did not appear too difficult but now the number discovered has reached a total of twelve, and the scientists have invented another one, the neutrino, to stick into unsolved problems
>
> The realm of atoms begins with Hydrogen, which consists of a proton with an electron revolving around it The proton has unit atomic mass The electron is much lighter It would take 1,845 electrons to make up the weight of a proton The most recently discovered particles, the "V' particles, discovered in cosmic rays,

have a mass greater than a mass of atomic weight between 2,100 and 2,300 electron masses These are too heavy to fit into the fun damental particle picture They are reaching over the upper boundary into atomic dimensions and because of this transgression all but four of the basic atomic fundamentals out of the twelve invented can be explained out of existence

The number of basic fundamental particles is thus reduced to four, the positive and negative electrons, and the positive and negative protons But the positive electron and the negative proton disintegrate in the presence of their vastly more powerful mates, which reduces the permanent list to the original positive proton and the negative electron with which the whole drama of funda mental particles started What are they? According to one scientist, they are 'too simple to know anything about them'

THE CREATION OF THIS PLANET AND ITS ELEMENTS THROUGH THE MEDIUM OF PRECESSION

When great masses of Hydrogen atoms are thrown off from one of the Suns of the Universe, they join together to form a nebula which takes on a direction of rotation on an axis per pendicular to its radius vector, and a motion of translation along an orbit which is orthogonal both to the radius vector and the axis of rotation

The energy and matter of this earth were created when the earth was subject to cosmic influences, not the finite influences of the earth such as gravity, light and heat, as we know them today

As this nebula of cosmic Hydrogen travelled out into space it became cooled down below the freezing point of Hydrogen —259 7°C forming a solid mass with a sense of gravity forcing it to change its course back toward the sun

As this mass of frozen Hydrogen approached the sun it liqui fied, then vaporized and burst into flame when certain of the atoms of Hydrogen were precessed to the perpendicular and thus enabled to join with other atoms of Hydrogen to create Helium.

Then this nebula of Hydrogen and Helium circled the Sun and travelled out into space again repeating the same procedure freez ing into a solid mass then returning to the vicinity of the Sun again

The next time it approached the sun certain of the atoms of Helium were precessed to the perpendicular enabling them to combine with other atoms of Helium and Hydrogen to form Lithium

As the comet passed out into space the Lithium solidified much more quickly than the Hydrogen and Helium solidified, therefore the cycle of the orbit of the comet was shortened and the comet returned to the sun sooner than before

On each return visit the comet burst into flame creating the higher elements as they exist in the earth today It has taken billions of years to transform the nebula of Hydrogen Gas with its comet like orbit, to the earth, as we know it today, with its higher elements and its yearly orbit

It is assumed that the formation of the earth was brought about through the directions of motion of the axes of energy— the axes of vibration, rotation, translation or stabilization—the axis of vibration acting as a centripetal force to bring the par ticles of matter together and consolidate them, the axis of rota tion acting as a centrifugal force to disperse the particles of matter When these two forces are combined they precess either to an axis of translation and burst into flame, the vibrons and rotons supporting the substance of matter, precessing to an axis of consolidation through which the elements of matter consoli date creating the flame, the remaining vibrons and rotons are precessed to an axis of translation and spin creating the beams of light

According to Arthur L Kimball, a noted physicist

> The atoms of matter consist of central postively charged nuclei surrounded by negatively charged particles called electrons In a neutral state, when no electrification is present, the negative charges of the electrons which surround the nuclei are sufficient to neutralize the positive charges of the atomic nuclei Although the

electrons individually repel each other, the positive charges of the nuclei are sufficient to hold them in their proper place in the atom Certain of the outer electrons of the atom are not very strongly held, however, and are easily displaced or removed These external electrons are often called the "valence electrons" because they determine the valence of the atoms

Another noted physicist, J J Thompson, proposed that the protons determine the valence of the atoms

We are inclined to agree with Thompson that it is the vibrons which serve as the valence axes, and that a univalent is an element that possesses one vibron axis through which it is enabled to combine with one other element to form a compound A bivalent is an element which possesses two vibron axes, at right angles to each other, through which the atoms of the element are enabled to combine with two other elements A trivalent has three orthogonal vibron axes enabling it to combine with three other elements, etc A monovalent or monatomic is an element which does not develop even one vibron axis until reduced to very low temperatures losing nearly all its electrons (rotons)

As the valence of each group of elements increases the senses of the vibron axes switch over from positive (alkali) to negative (acidic) Monatomics, monavalents and univalents exist in their natural state in the form of gases, while bivalents exist as crystals, and trivalents and all other elements with higher valences exist as metals All metals must have three or more orthogonal vibron axes to hold them together in their solid metallic three dimensional state

The elements can be separated into series and groups based upon their atomic weights, valences, and their alkali or acidic characteristics The first series consists of 81 elements divided up into groups of 9s and 18s, each group starting with an ele ment of a basic nature which is univalent or monatomic, progressing through the multi valents then receding back to uni valents of an acidic nature, indicating a swing in sense from 0° up through a 90° angle, then back to a 180° angle in the opposite direction (See Chart #I in the chart section at the back of the book)

Groups I to IX listed pages 144-148 give each element its number, abbreviation, atomic weight, valence, outstanding characteristics, and where generally found.

The simplest substance known is Hydrogen. The Hydrogen atom consists of one proton with one electron rotating about it. Atomic weight 1.0078. Hydrogen may be isolated as a colorless, tasteless, odorless, inflammable gas (burning with a hot, almost non-luminous flame with oxygen to form water); lighter than any other known substance. Free hydrogen occurs very sparingly on the earth, though it is abundant in the atmosphere of the sun and many stars.

When hydrogen and oxygen combine through combustion, they separate into rays of light, which shoot out into space, and waves of energy, which condense into water.

If an atom of hydrogen loses its single electron it consists of a solitary nucleus of vanishingly small spatial dimension as compared with atomic dimensions.

Helium, the Number 2 element, consists of two protons, two neutrons and two electrons. It is a colorless, inert gas, sometimes found in mineral waters and certain minerals.

If one of the electrons is removed from an atom of Helium, a Helium ion, consisting of a double charge nucleus with one electron rotating about it, is formed, differing from a Hydrogen atom only in size. Because of the two-fold attraction of the Helium vibrons, the Helium ion is only half the size of a Helium atom, but its weight is 4.002, the same as a normal Helium atom.

Lithium, the lightest known metal, weight 6.940, is a soft, silver-white metal of the alkali group. Beryllium #4, and Boron #5 are both extremely hard silver white metals. One of the hardest elements known is the diamond, a form of Carbon #6.

Nitrogen #7, Oxygen #8 and Fluorine #9 exist in pure form as gases. These three gases complete the cycle of the first group of nine elements. Nitrogen is a colorless, odorless gas which makes up 78.03% by volume of the earth's atmosphere.

It is found in all living tissue Oxygen, a colorless, odorless gas, makes up 21% by volume of the earth's atmosphere It readily combines with all other elements except Fluorine #9 and Argon #18 Fluorine, the last element in the first group, is a pungent corrosive gas of the chlorine family

The creation of the higher elements in each group from the lower elements in that group is brought about through the precession of the axes to a perpendicular position of one of the elements enabling them to combine with other elements in that group to bring about an increase in weight and potential This precession of the axes to the perpendicular is brought about by an increase in rotons (an increase in heat) to the degree that they change their direction of rotation and thus force the vibrons to change their position to the perpendicular relative to the axes of the other elements with which they are enabled to combine

Each step in the advancement of the elements from elements of a lower order to elements of a higher order is accompanied in the beginning by an increase in the valences (the number of axes) of the next higher element, up to the fourth, fifth or sixth elements in the group in which four, five or more valences are established From there on, however, as the axes of the elements change their sense from alkali to acidic, the valences (number of axes) diminish, ending up with a univalent or monatomic element whose sense is inverse to the sense of the axis of the first element

One would think that the cycle would be completed with this inversion of the axes (180% angle), but this is not the way nature works Starting with the next higher group of elements, nature has found a way of combining two inverse elements, Hydrogen #1 and Fluorine #9, by means of an increase in rotons (increase in heat) so that the Fluorine #9 is transformed into Neon #10, a colorless, odorless, inert gas, creating a new group of elements starting again with an element of the alkali family

It must be kept in mind that these elements of the earth were all created while the earth was subject to the cosmic influences of the universe, while the earth existed as a comet, before it settled down to its present form existing as finite matter with its own orbit, axis of rotation, force of gravity and magnetic flux.

In the next group starting with Neon #10 there is Sodium #11, Magnesium #12, Aluminum #13, then three non-metallic substances, Silicon #14, Phosphorus #15, Sulphur #16, then the heavy irritating gas Chlorine #17, ending with another colorless, odorless, inert gas, Argon #18.

The third and fourth group of 18 elements (9 and 9) start with Potassium #19, a soft metal, and includes the more common metals Iron #26, Nickel #28, Copper #29, Zinc #30, switching over to the non-metallic substances, Selenium #34, Bromine #35, and then ending with another inert gas, Krypton #36.

The fifth and sixth group of 18 elements (9 and 9) start with the soft metal Rubidium #37, include the well-known metals Silver #47, and Tin #50, then turns to the crystals Antimony #51, Tellurium #53, Iodine #53, and end with the inert gas Xenon #54.

The seventh and eighth groups of 18 (9 and 9) elements start with the soft metal Caesium #55, include the Rare Earths which are soft, malleable, metallic substances, and end with a crystalline substance, Hafnium #72.

The next group of nine elements starts with the hard metals Tantalum #73, Tungsten #74, Platinum #78, then shifts to the malleable element Gold #79, Mercury #80, ending with Thallium #81, a metal of the aluminum family. This completes the nine groups of Series I, making a total of 81 elements.

As elements advance from elements of a lower order to elements of a higher order their characteristics change in that they change from a tolerance to cold, to a tolerance to great degrees

of heat Hydrogen, the #1 element, melts at –434 degrees F and vaporizes at –422 7 degrees Helium melts at –456 F and vaporizes at –449 Molybdenum #42 of Series V melts at 4595 degrees F and vaporizes at 6548 degrees F Tungsten #74 of Series IX melts at 6152 and vaporizes at 10,520 degrees F Iron exists normally as a solid mass When heated to 2786 degrees F it melts and when heated to 4442 degrees F it vapor zies Mercury exists normally in liquid form When cooled to –37 97 degrees F it solidifies and when heated to 680 degrees F it vaporizes Krypton exists normally as a gas When cooled to –241 it liquefies and when cooled to –272 it solidifies

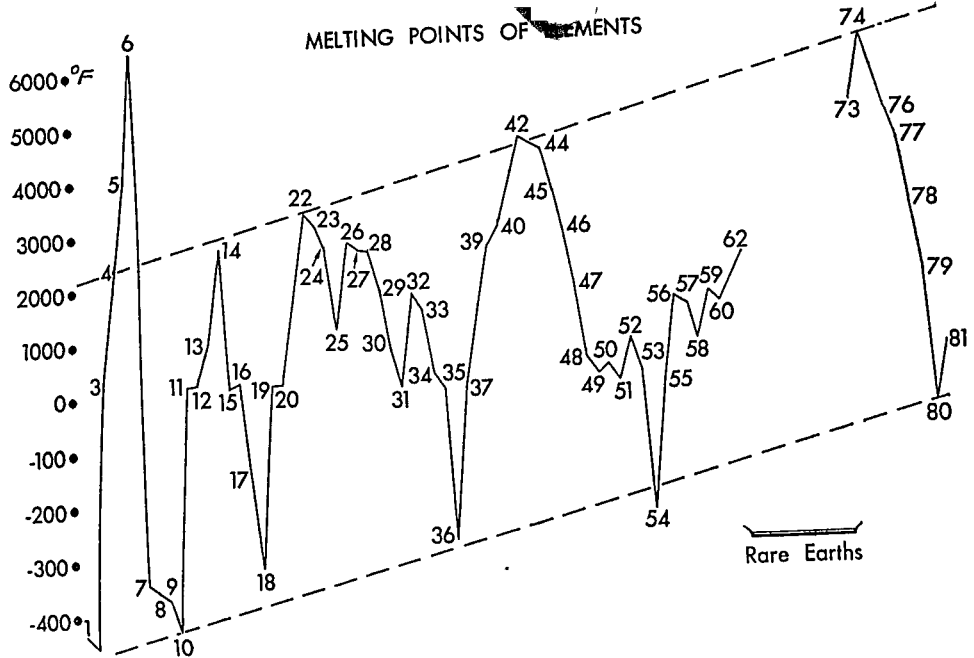
Each series of elements in general begins with an element with a tolerance for cold, develops a tolerance for heat and then reverts back to a tolerance for cold, with the higher series de veloping less tolerance for cold but a higher tolerance for heat

A graph showing the melting points of the Ist series of ele ments is herewith presented

It is interesting to note that as we go up the scale after the first group of elements which contains the elements with the lowest melting point, Helium –456° F, and the highest melt ing point, Carbon 6332° F, the low boiling point becomes less while the high boiling point increases up to Tungsten 10,520° F Would not this indicate that the first group contains the basic elements from which all the elements in the other groups are derived? And that as the elements progress in parallel series from group to group their capacity to retain rotons increases?

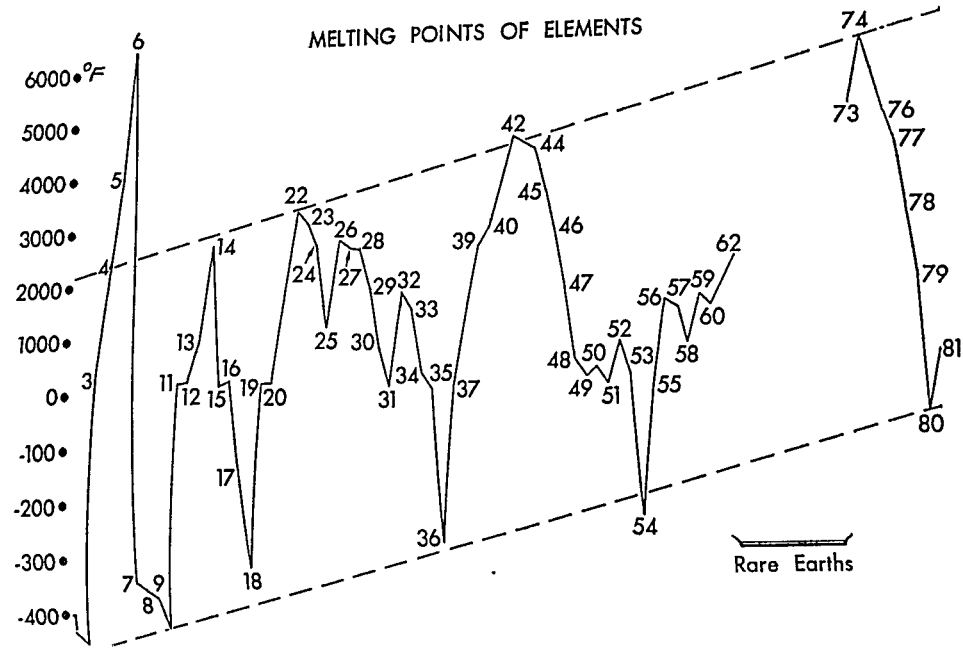
The senses of direction of the axes of elements is the im portant factor for determining the characteristics of the ele ments Each new group of elements starts off with an alkali and progresses through the various valences, then reverts over to the acidics, ending up with a strong acidic element

In Chapter III it was pointed out that when the rotons are parallel to the vibrons, chemical energy is generated, and when vertical to the vibrons, electrical energy is generated We now come to radio active energy in which the vibrons and rotons


MELTING POINTS OF ELEMENTS
6000 °F
5000
4000
3000
2000
1000
0
-100
-200
-300
-400
Rare Earths

function perpendicularly to each other in separate planes, latical (see Chart #II).

Starting with Lead #82, a whole new series of elements have been discovered which possess radio-active properties. Only a few of the elements in the first two groups of this series have as yet been uncovered, and very little is known about the elements in the second group except that they are radio-active.


MELTING POINTS OF ELEMENTS
6000 °F
5000
4000
3000
2000
1000
0
-100
-200
-300
-400
Rare Earths

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CHAPTER V

LIFE AND EVOLUTION

ANIMATE LIFE and inanimate energy are two separate and distinct studies There is, however, a relationship between the two which indicates that both are controlled and directed to some extent by similar, if not the same, laws

In Chapter IV it was pointed out how the higher elements are developed through a combining and precessing of the lower elements up to and through the higher radio active elements From there on it is not clear just what happens Is there any reason to believe that the development of higher forms of energy should cease at that point? Let's look into it a little farther

The higher elements were developed through a series of pre cessions brought about by an increase in sensitivity to the degree that the axes of the lower elements changed their positions, at which moment they were enabled, through the medium of com bustion, to absorb additional energy and establish a new and higher element on a newly formed precessed axis

When the atoms of an element are sensitized to the point of combustion, the substance and sensitivity (axes) of one element combine with the substance and sensitivity of another element to create new and higher forms of energy

In the cosmic world, before this earth was created in its finite form, these new and higher forms of energy resulted in the development of higher elements, but since this earth became a finite body such forms of creation no longer exist The creation of new and higher forms of energy here on earth follow the same pattern but the medium, instead of combustion, becomes fertilization

A seed planted in the ground, when sensitized by the heat

from the sun, precesses its axis so that it is parallel to the sun's rays and the force of gravity of the earth When these two forces of energy the radiant rays of light from the sun with their rotons spinning and rotating at terrific speed, and the force of gravity of the earth with its vibrons vibrating and pulsating, are lined up parallel to each other, the axis of the seed is lined up parallel, enabling it to take in nourishment and grow

But, before growth is possible, there has to be a previous re action of fertilization In plant life this takes place while the seed is attached to the mother body Here it is termed pollina tion Fertilization is a fusing of the male and female molecules of each species Actually it is a fusing of two complementary forms of energy, just as combustion is a fusing of two com plementary forms of energy

All energy is separated into two complementary categories One form of energy functions on an axis of vibration, the other on an axis of rotation When these two complementary forms of energy join together, either through the medium of combus tion or the medium of fertilization, their axes join together and precess to a third orthogonal position to establish a new and higher form of energy

It makes little difference what we term these forms of energy We can say that the one functions on an axis of vibration, the other on an axis of rotation We can say that the one is a wheel like form of energy, the other a top like form of energy We can call one a sperm, the other an ovum, or we can call one male, the other female Whichever term we use, it resolves back to the same thing, the one functions on an axis of vibration, the other on an axis of rotation All energy and all creation func tion on this simple basic principle, i e , the combining and pre cessing of complementary, or inverse, forms of energy to create new and higher forms of energy

Conception, or pollination, is the fusing of complementary (perpendicular) male and female forms of energy, while growth is a supplementary (parallel) fusing of energies of the same nature

Plants come to life in the springtime when the sun has reached an angle in the sky enabling its rays to line up more or less parallel to the radius-vectors of the forces of gravity. At this point, not only the axes of the seeds and plants are precessed so that they line up parallel, but all the elements of the earth from which plants derive nourishment are also lined up parallel so that plants can absorb energy and grow.

In inanimate energy, the elements line up parallel and fuse their axes together to produce liquids and solids. In animate energy, a similar alignment brings about the reaction of growth. The melting point for inanimate elements is the degree at which the molecules of the elements precess their axes to permit the molecules to function independently. Animate bodies do exactly the same thing, the melting point being the body temperature.

Digestion is a process whereby the elements are broken down and rearranged with their axes parallel so that they may be absorbed and fused into the absorbing body.

Animate life, because of the high degree of sensitivity retained within the body, maintains itself in a molecular free state in which it is enabled to assimilate food and grow; while inanimate elements have to be heated from sources outside themselves to supply the necessary sensitivity. A list of the elements and where they are found in living tissue is listed in Chart #III.

Living bodies are divided up into groups termed species, just as matter is divided up into groups termed elements; and it seems logical to assume that the various species of life stem from the various elements, the lower species stemming from the lower elements, the higher species from the higher elements.

This is brought about by the fusion and precession of the elements and their isotopes when acted upon by radio-active substances under certain conditions when their vibrons and rotons are lined up complementary to each other. At this moment the vibrons of chemical substance fuse with the complementary vibrons of radio-active substances and precess to a perpendicular direction to establish an axis capable of sustaining life, each

species of life springing from a different element or the isotopes of the elements.

Life energy is one step above radio-active energy. In radio-active energy it is the rotons which, when precessed to the latical, rotate head first at terrific speeds, creating the extreme degrees of heat. In the creation of life energy, it is the vibrons which precess to the latical and vibrate with unusual energy to create the pulsations which sustain life.

The various elements have been listed stating where they are found in plant life and living tissue. It is believed that all living bodies, particularly the human body, contain traces of every known element, certain elements being used to establish special functions in the body, other elements to establish other functions.

Most of the elements of Group I, plus certain other elements, are necessary for supporting life (Chart #IV). The elements in Group II, plus Lithium, Boron, Calcium and Cadmium, are used as building blocks. They are prevalent in all living tissue. Then there are the elements sensitive to light, air and water, Magnesium, Potassium, Selenium, Rubidium, Palladium, Silver and Barium. Some elements are quite stable—Chromium, Nickel, Ruthenium, Tin, Tantalum, Osmium and Gold. Some are good conductors—Copper, Selenium, Silver and Mercury. Some are capable of resisting high degrees of sensitivity—Carbon, Molybdenum, Rhodium, Tantalum, Tungsten and Platinum. Some liquefy at nominal temperatures—Sodium, Phosphorus, Potassium, Galium, Bromine, Rubidium, and Iodine. Each of these elements plays a particular role in the creation and support of life.

Just what part each element plays in the creation of life is a subject which is being determined by those trained in scientific methods. The various elements have been charted in the preceding chapter as to their melting points. Not only are the melting points of the elements of great interest, but their sequence and periodicity are also of great interest.

Living cells are stabilized forms of energy which have been

sensitized over and beyond the degree of sensitivity of radio active energy This sensitivity is used and co ordinated to create and preserve life, so that instead of shooting its vibrons and rotons out into space, as radio active energy does, the vibrons take on the duty of absorbing energy, while the rotons transmit the sensory impulses to all parts of the body

The purpose of life energy is to grow and reproduce so that the form of life, whatever the species, may develop into a species of a higher order A tentative list of the various species of life and the strata of inanimate elements from which they have sprung are listed in Chart #V starting with Group III of Series II, where the radio active elements leave off

It is quite simple to conceive of a gas expanding, igniting and separating into inward and outward energy, but to have a form of energy which can expand to a certain point, then separate into two equal parts appears quite supernatural, which of course it is To conceive of a seed placed in the ground growing is fairly simple, but not only does the seed grow bringing about the duplication of cell structure, but each atom of the seed, per forms a specific function of proliferation, certain parts growing to produce a stem, others the branches, others the leaves, others the roots, while still others produce the blossoms and seeds

This in parallel reproduction of growth is one of the greatest miracles of which the human mind can conceive It is exceeded only by the miracle of the fusing of complementary forms of energy in the creation of higher forms of inanimate energy and the fusing of complementary male and female forms of energy in the creation of new and higher forms of life

As the earth was gradually transformed from a nebula to its present state, the natural processes of condensation, freezing, gravity, magnetism, electricity, melting, evaporation and expan sion began to take effect to bring about a levelling off of the hills and mountains that had been built up by internal pressures If the natural laws of decomposition and deterioration had been permitted to function indefinitely, the surface of the earth would in time have disappeared under the surface of the water

The laws of nature function throughout the universe the same as they do on a piece of machinery left to the mercies of the elements It gradually disintegrates To function properly, machinery must be constantly repaired or its parts replaced through the ingenuity of the human mind So with the earth, if it had been left to the mercies of the elements, it would in time have disintegrated and become decomposed, but before this happened, "Life took hold"

Plant life was created to preserve and protect the land and supply sustenance for other forms of life Animal life was created to supply nourishment for higher forms of life and aid man in accomplishing certain tasks Human life was created to sustain, protect, reproduce and develop the human mind

The human mind was created, not so much for the purpose of developing a greater physical body, but more for the purpose of developing a higher degree of consciousness Those animals which developed to greater size have pretty much disappeared from the face of the earth, while those which have been enabled to develop their higher sensibilities have survived and multiplied in abundance

The transformation of chemical, electrical and radio active energy into living energy was not accomplished in one or two fusions and precessions It took thousands and thousands of years of fusions and precessions before life, as we know it today, came into being, and all plants, animals, and other forms of life, including human life, are still going through these fusions and precessions in the development of higher species of life here on earth

The fusions and precessions of all living things are controlled and directed to a large degree by the forces of nature, i e, the force of gravity, the rotation of the earth with its hours and minutes, and the direction of the earth's axis which provides for the seasons

If it were not for these natural causes which supply the neces sary stimulations and checks so that plants will not spring to life in the middle of winter, and also provide for the precessions of

their axes so that they do not grow upside down or sideways, life on this earth could not endure

And although we may not realize it, mother nature determines sex for us When a seed or embryo is fertilized, through pollination or fertilization, the embryo in the beginning has no sex Not until it attaches itself to the mother body, be it the earth itself or some other body, and starts to grow, does the embryo acquire sex Sex is determined by the positions of the newly precessed axes of the embryo when the embryo starts to grow

If the outer axes of the embryo are vertical to the earth when the embryo starts to grow, the embryo will develop into a female, if the outer axes are horizontal, the embryo will develop into a male

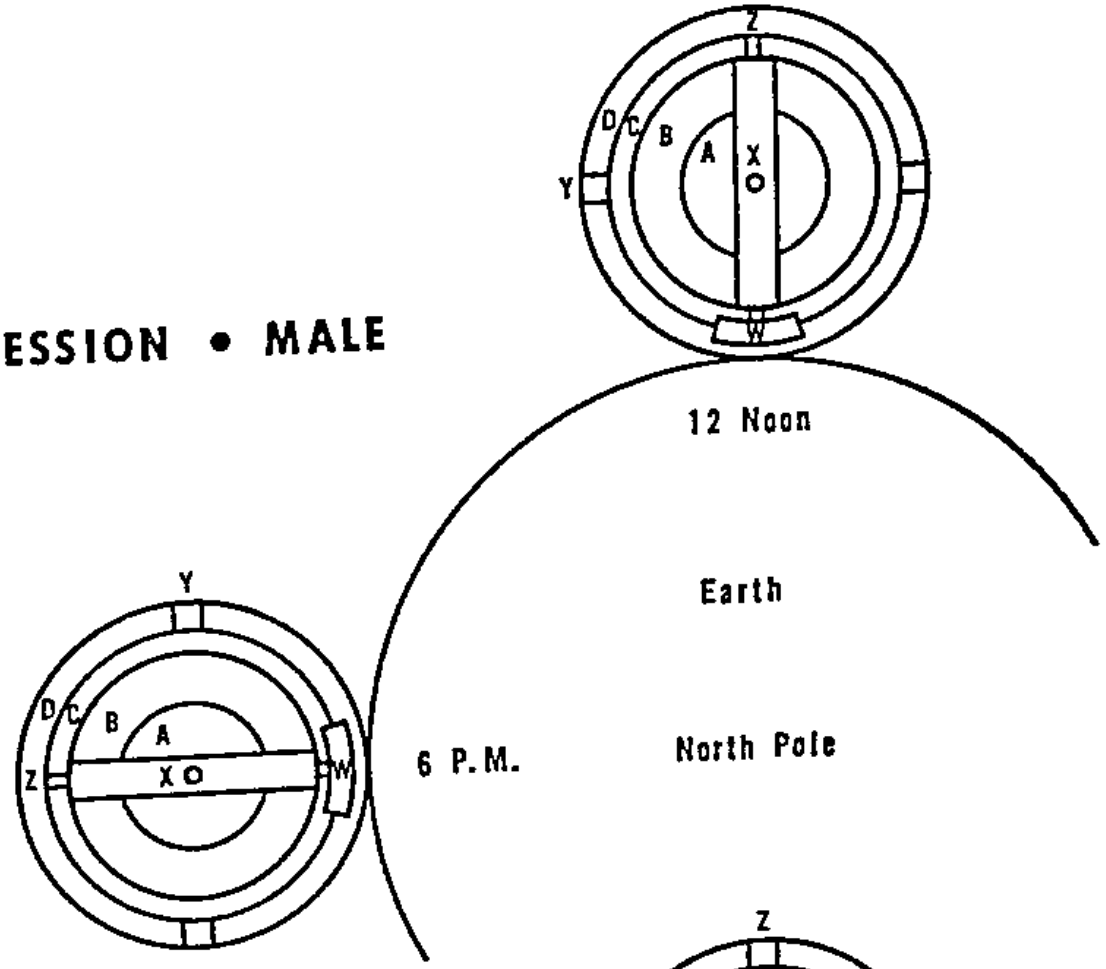
Just how this takes place can best be described through the example of the gyro compass Assuming that the gyro compass is an embryo (Fig 56 similar to Fig 35, page 38), when it is stabilized on earth at the 12 o'clock position with its outer axis horizontal (yy), this axis will serve as the axis of vibration affected by the pull of gravity, the inner axis (zz) serving as the axis of rotation While if the axes are stabilized at the 6 o'clock position, the outer axis will be the (zz) axis subject to rotation, while the inner axis (yy) will be the axis of vibration In both cases the primary axis (xx) will precess to an orthogonal position This is the axis of direction on which the gyroscopic compass functions and presumably affects the sense of direction (sensory perception) in the human mind

What this finally resolves itself down to is the fact that sex is really determined by the co-ordinates—time, space and direction The direction and position of the axes when they come in contact with the earth, or the mother body, is an important factor in determining sex Another important factor is the time of day in which contact is made The third factor, of course, is the place at which contact is made, whether it be at the 12 o'clock position, the 6 o'clock position, or some other position

When the gyro becomes stabilized at the 12 o'clock position, the weight (w) which transforms the gyro into a gyro-compass

HORIZONTAL PRECESSION • MALE

Weight Effects Outer Frame



VERTICAL PRECESSION • FEMALE

Weight Effects Inner Frame

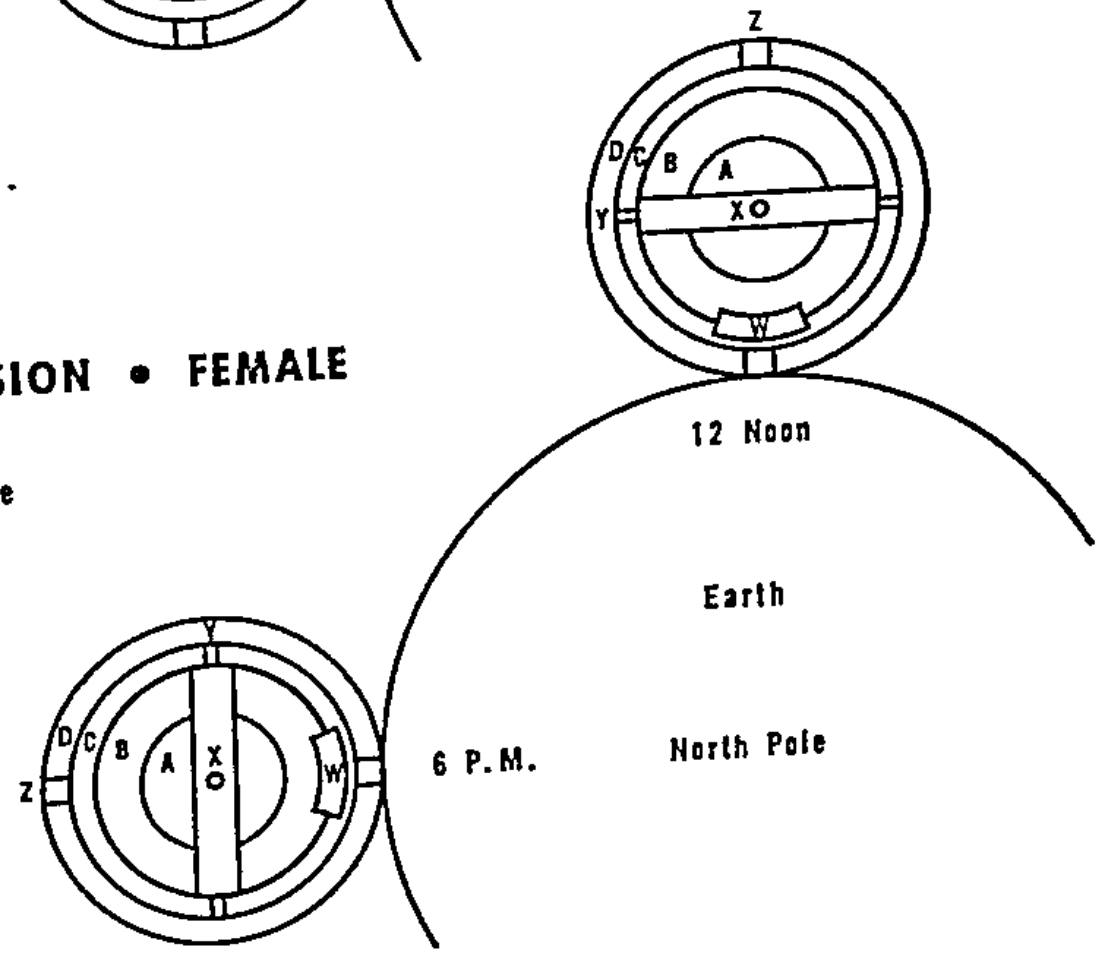


Fig. 56

will affect the outer axis (yy), while if stabilized at the 6 o'clock position the weight will affect the inner axis (yy)

Every living embryo has its own sense of direction which we term sex, either male or female The sex organs serve as weights If the organism establishes itself in the horizontal position, the sex organs will have to be associated with the outer axis, develop ing into a male, while if it establishes itself in the vertical posi tion the sex organs will control the inner axis developing into a female

The alignment of these axes not only establishes the sex of the embryos but it also accounts for the distinctive characteris tics of each sex In the first place, because of the positions of the inner and outer axes, the female will have smaller shoulders and larger hips (Fig 57-4) while the male will have smaller hips and larger shoulders (Fig 57 3)

The male with its outer axis controlling growth and reproduction, will have its sex organs outside of the body, while the female with its inner axis controlling these functions will have its sex organs within the body

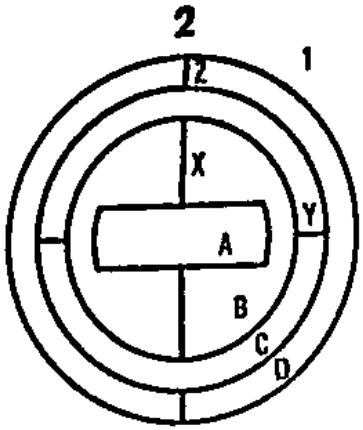
The female sex organs produce an ovum, a top like spinning organism with no means of locomotion, while the male sex organs produce a sperm, a wheel like organism able to move about When these two organisms are stimulated to activity, the wheel like sperm travels outward and is attracted by the comple mentary sensitivity of the spinning ovum with which it unites, resulting in fertilization

Neither ovum nor sperm can function creatively until joined *together and precessed to a third orthogonal axis which serves as* a basis for the creation of life This is the secret of creation It is the creative directing force of Nature Without this direct ing force there could be no life, no creation, no growth, no birth, no sense of direction or sensitivity here on earth

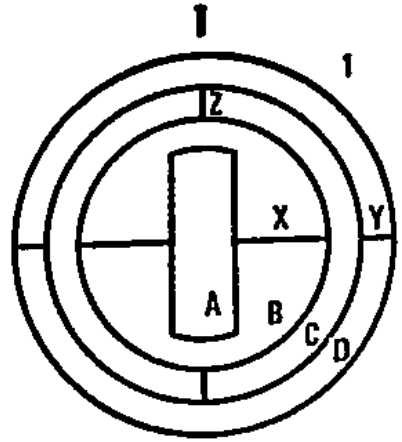
LIVING VALENCES

Plant life is constructed on a single axis, univalent, from one end of which the branches, leaves and flowers extend, while from

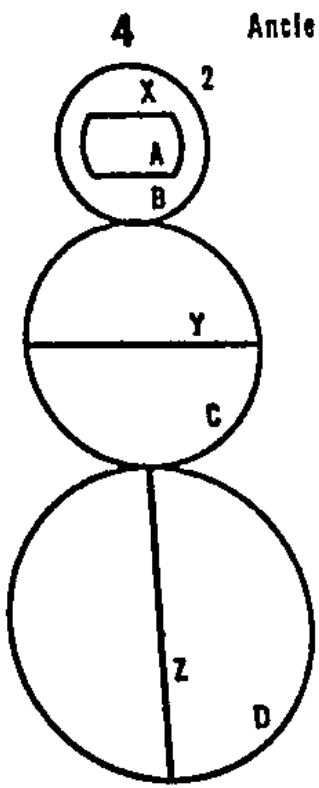
HUMAN EVOLUTION



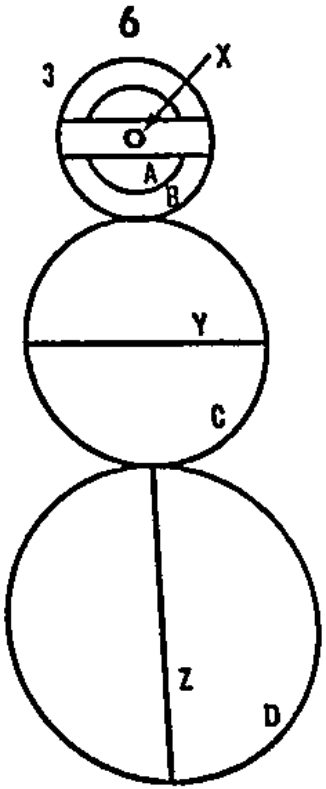
FEMALE



MALE



STABILIZED



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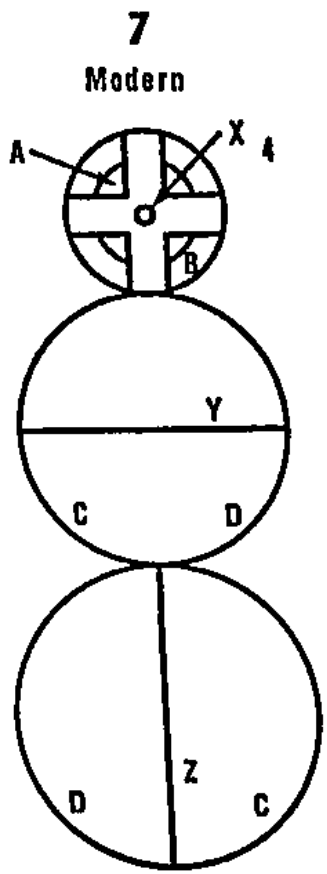
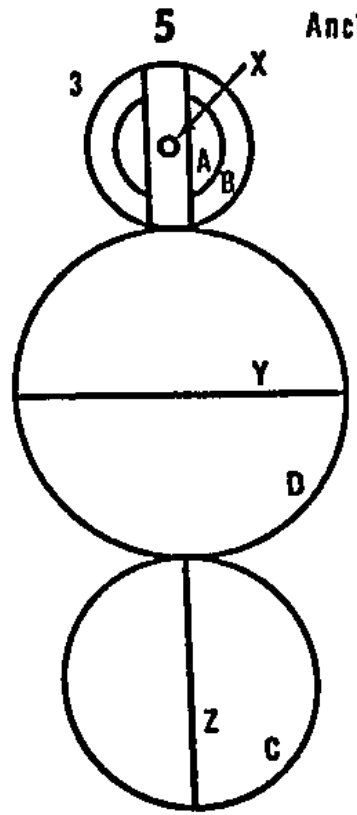


EVOLUTION



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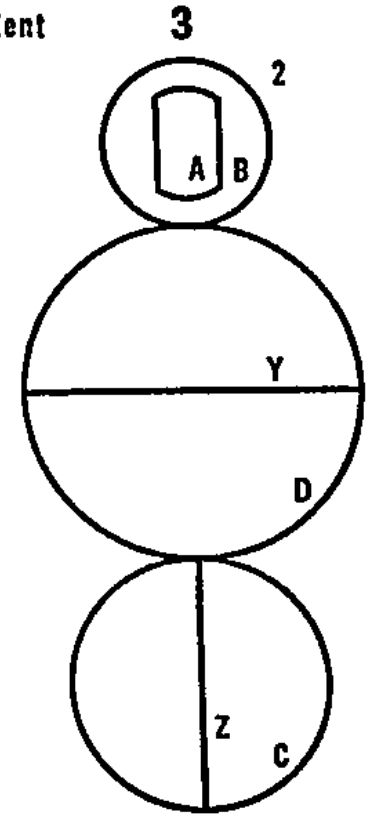


STABILIZED

Fig. 57

end of which the branches, leaves and flowers extend, while from the other end the roots extend into the ground (Fig 58 a) one axis and the body functioning on an orthogonal axis (b) Animal and human life are trivalent forms of life with the head functioning on one axis, the body on a second axis, with the limbs functioning on a third orthogonal axis (Fig 58-c) The human body is a refinement of the animal body with the arms functioning orthogonal to the limbs

EVOLUTION

The human body, like all other living bodies, begins life as a single cell organism Through thousands of years of fusions and precessions of the complementary male and female organisms, the human mind and body have been developed to their present state The result of this evolutionary process which has taken thousands of years to progress to its present state of existence, can be acquired today in a comparatively short period of time—just a few months and years This evolutionary process is still continuing unabated today

Evolution in this finite world is more than just a transforma tion Finite evolution does not include the transformation from one species to another That transformation took place in the cosmic world when the earth was being formed Cosmic evolu tion was the creation and development of the various elements in the atomic chart which took centuries and centuries of fusions, precessions, precipitations, solidification, meltings, vaporizations and combustions from hydrogen up through the higher elements

Finite evolution is the transformations and transitions of the elements from their inanimate state to a state in which they sprang to life and developed into species This was brought about through the precessions and fusions of the elements with the radio-active energy of complementary elements of a higher order The transformation is a change in form and construction from a single cell body to a multiple cell body, while the transition is this same change brought about in a shorter period of time

The Darwinian Theory of Evolution, while correct in sub-

LIVING VALENCES

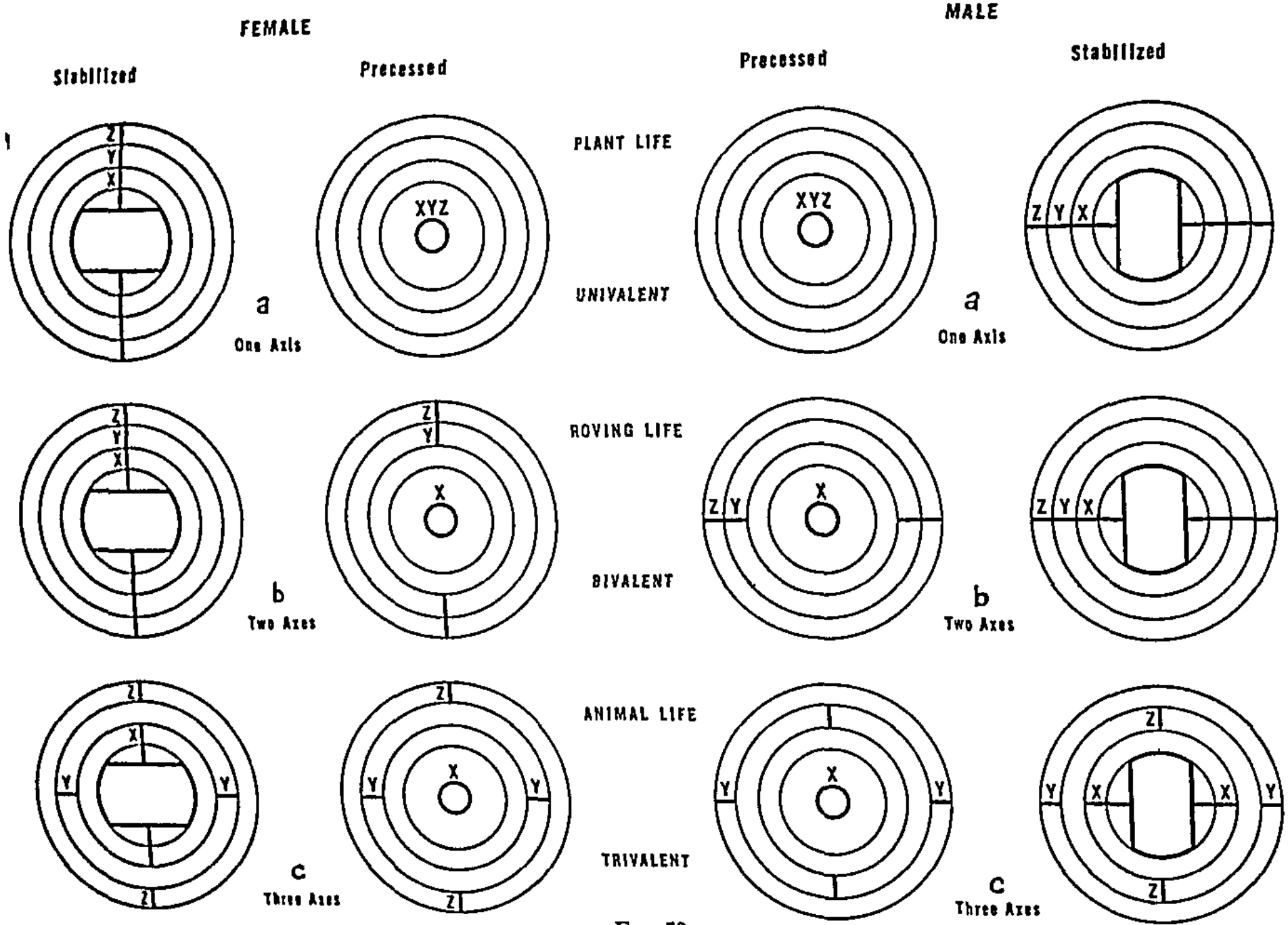


Fig. 58

stance, does not distinguish between cosmic and finite evolution Doubtless everything that exists started its existence as a single cell unit of energy, yes, we can go even further than that, it probably started as either a quiver, a vibration, a spin, or a rotation, but the evolution of the elements and the evolution of the species of life did not progress side by side Living organisms could not have endured the extreme degrees of heat and cold necessary for the fusions and precessions of the elements while building up from elements of a lower order to elements of a higher order

By the same token, the elements could never have been created if limited to the degrees of heat and cold necessary to sustain life The evolution of living organisms must have begun some time after the creation of radio active energy, and after the earth changed from a comet traveling back and forth between the sun and outer space, to the finite globe traveling in its regular orbit about the sun During the intervening period there were probably periods when parts of the earth became very warm and humid It was during these periods that the embryos of living species sprang to life

The evolution of the human mind and body might be likened unto the evolution of a book The first writings had no resemblance to a book as we recognize it today It was a group of very crude drawings representing places or things molded in sand or clay, termed "Imitative Magic" As time progressed, various signs and symbols were invented which were carved in wood and more durable substances Cuneiform writing and phonetic symbols were introduced about 3800 B C The Greek alphabet came into being about 1000 B C Paper was invented about 200 B C, Arabic numerals A D 1100, printing A D 1400, and with printing came the art of book binding

Book making was not perfected by one nation, one race, or even one generation It has evolved to its present state through the cumulative efforts of many thousands of people over the past few thousand years If every time a person wished to publish a book he had to start in at the beginning and invent not only an alphabet but also the ink and paper on which to

express it, it would take thousands of years to get a book out instead of the few months or even days in which that task is accomplished today. This is what we have grown to recognize as an advancement in civilization. Each evolutionary process goes through a similar development.

As each process was perfected through the knowledge and understanding passed along from generation to generation, so the human mind has developed and evolved to a higher order of existence.

THE HUMAN BRAIN IS A POTENTIAL STORE-HOUSE FOR STORING UP THE FORCES OF ENERGY; AND WHILE THE MIND DOES NOT OF ITSELF CREATE ENERGY, IT, LIKE NATURE, HOLDS THE KEY FOR LOCKING UP OR RELEASING MANY FORMS OF ENERGY.

The trouble with most of us is that our minds are locked up so tight, or so set in certain directions that it takes a strenuous effort to pry them loose so that they can function freely and creatively, not only in their set direction, but in other directions as well.

The human mind, like every other form of energy, is dimensionalized into three orthogonal dimensions, not only for the brain as a whole, but for each separate section into which the brain is divided, each molecule, and each atom. Each of these components has its own axis of translation, vibration and rotation through which it acquires its sense of time, sense of space, and sense of direction, and it is through the dimensionality of these senses that the mind acquires its sensory perception.

The human mind is endowed with exceptional powers for development in all dimensions. It has a material or spatial coordinate—an axis of vibration—through which it is enabled to bring about physical and anatomical transformations, including the creation of new life. It has a temporal co-ordinate—an axis of rotation—through which it is enabled to develop life of a higher order in a shorter period of time to bring about certain transitions. And it has a directional co-ordinate through which it

acquires its sense of direction thus enabling it to develop sensory perceptions which enable it to communicate with others for the development of a higher order of life

A change in sense of direction is designated by several different terms so it might be well to pin point certain of these changes in order to understand one another better Let us specify certain terms to indicate certain meanings such as

Transformation—a precession of two complementary or inverse vibrons to a perpendicular to create a new form of energy

Transition—an increase in the velocity to bring about a change in a shorter period of time

Conformation—a change in alignment of the vibrons or rotons to bring about a change in the sense of color, taste or smell, or a change in other senses such as the changes from sorrow to joy, pain to pleasure, hate to love, fear to compassion, ugliness to beauty, evil to goodness, false to true, meanness to kindness, etc

Conversion—a change in sense from negative to positive

A conformation is not a change in body formation which would result in a transformation, nor is it a change brought about through the motions of time It is purely a change in sense brought about through a slight change in alignment of the vibrons or rotons to create a change in mental attitude or perception

A conversion, on the other hand, is not so much a change in alignment, but a change in sense from negative to positive, right to left, backward to forward

By designating these terms we will be enabled to distinguish more clearly between changes in body or form—transformations, changes in velocities or time—transitions, changes in alignment—conformations, and changes in sense—conversions

CHAPTER VI

THE CONSCIOUSNESS OF TIME

ONE OF THE MOST BASIC THINGS in existence is time. Time is both duration and succession conceivable only in terms of motion, usually conceived as a uni-dimensional flow.

In Chapter III it was pointed out that the universe is divided up into universal dimensions with axes which control the direction of motion—translation, vibration and rotation, and that these axes of motion are subject to the various speeds and accelerations of motion from the slowest, which functions on an axis of vibration, to the next slowest, functioning on an axis of rotation, to the fastest, which functions on an axis of translation.

So we find that time and its motions are not restricted to the single dimension of translation, duration or succession. Time has other dimensions. It also has a dimension of vibration which is its breadth, and a dimension of rotation through which it acquires depth.

Just how these senses of direction were derived has never been thoroughly investigated. All we know is that they do exist and that through them we are enabled to conceive of the various forms of energy from the magnetic compass to the gyro-compass, the gyro wheel, the spinning top, the rolling hoop, the water-wheel, the electric motor, and many other forms of energy such as fire, light, gravity, electricity, magnetism, radio waves and radio-active energy, all of which are made realities in the human mind through their axes of direction.

C. H. Whiteley, in his "Introduction to Metaphysics," states:

> Common sense, when it sets out to describe the world, does so in a great variety of sensible qualities, hot and cold, wet and

dry, hard and soft, light and dark, and so on Coal is hard, black, solid, heavy, sugar is soft, white, sweet, etc But in the description of the world given by modern physics no such properties appear Atoms and electrons are not credited with colour, warmth or coldness, hardness or softness, or any other properties of sound, smell or taste They are credited with a position, and a rate and direction of motion, and with certain other properties, of which mass, energy, electric charge appear to be the chief

Thus the development of physics has aggravated and intensified the problem of mind and body by stripping the material body of all these qualities which make up the content of our sense perceptions, and are attributed by common sense to external realities

Whiteley neglects the relationship between positions, rates and directions of motions on the one hand, and sensory perceptions on the other He does not associate the angles and directions of physics with the sensory perceptions of real life, as he states

> Consciousness is a property of certain complex material objects —namely, animal organisms It is not an essential and fundamental property of matter, but a derivative property which matter acquires or produces under certain rather peculiar conditions, when it is arranged in certain rare and special ways The difference between living things and dead things is great, but it is not a difference of ultimate nature, it is merely a difference in complexity of arrangement

Whiteley attempts to comprehend the relationship between arrangements in energy and the existence of life but concludes that "The whole alleged influence of mind on body is, from the scientific point of view, a mysterious anomaly"

Later on he states

> We cannot directly attribute the properties of sense data to material things, any more than to minds, and we can with as much sense and as much justification attribute such sensory properties to conscious beings as to other material objects

When the nature of direction and its relationship to sensory perception becomes established, it may be revealed that the sensory perception of the human mind functions along the same principles as the senses of direction of inanimate matter White-

ley does not take this into consideration when he states "There is no parallel between what I do and what the table does" If the atoms and molecules in the table had no senses of direction, and if the atoms and molecules in his mind and body had no senses of direction, neither the table nor Mr Whiteley could exist, and Mr Whiteley would not be able to be conscious of the existence of the table or himself

Sir Isaac Newton (1642-1727) states

In general we think of space as a three dimensional, homogenous, isotopic continuum Though time has only one dimension, yet the ubiquity through which all things are sensuously thinkable at some time, adds another dimension to the quantity of actual things, in so far as they hang, as it were, upon the same point of time (Newton grasped the significance of the dimensionality of time even though he did not explain it)

David Hume (1711-1775) states

Time is not known by itself but always by perceived succession The perception of time is nothing but the product of our mental disposition in relation to events or change, while our conception of time is purely a work of the imagination (Hume's conception of time is limited to one dimension, the dimension of length, duration, or succession)

William James states

The practically cognizant present is a saddle back with breadth from which we look in two directions into time Time may be divided into four categories—the obvious present, the specious present, with the concept of earlier or later which exists in the mind, the real present, and the future

Professor Mackenzie states

The intelligibility of time is the intelligibility of life itself (In essence this is true, for time is the source of all reality even though it does not contain the whole of reality Space, and the senses are also essential to the intelligibility of life)

J A Gunn, states

Time, while not itself the ultimate reality, is truly one form of manifestation of that reality Time is perceived as sensibly continuous, as having certain directional qualities, it is transitive and related to the content Time imparts a definite sense of direction

to events. We must never confuse time with either its limits or its dimensions. Time does not consist of *instants or moments*, but of the flow of events in a continuous order or process. We often picture time as a line, but it must be recognized that pure time, as length without breadth, is an abstraction. Time as a line can only stand for succession. We need, therefore, another line at right angles to this to represent simultaneity. There is another danger about the line presentation. It only becomes true when a sense of direction is given to the line. Each moment of attention has its own intensity.

Gunn senses the *dimensionality of time*. He lists them:

(Space)	=	(Length)	(Breadth)	(Depth)
(Time)	=	Succession	Simultaneity	Intensity

Or it could be:

(Time)	=	Duration	Simultaneity	Intensity

In order to get a clearer conception of the dimensionality of time, let us go back to see if we can discover where and how the *mind acquired its senses of direction.*

To begin with, we assume that all energy, to exist as such must possess three orthogonal axes which serve as axes of translation, vibration and rotation. Without each of these three axes to supply the necessary dimensionality to energy, energy could not exist, any more than matter can exist without three dimensions.

Next we have assumed that when matter is changed from a solid to a liquid or gas, each change is accompanied by a change in the direction of the axes of the element from a mass axis of stabilization, to a molecular axis of vibration, and then to an atomic axis of rotation. And when the axis of rotation of the atom is precessed from its universal direction of rotation, to a universal axis of translation, the atoms fuse with atoms whose axes are complementary, to bring about the reaction of combustion.

Every reaction in nature is brought into being through a sense of direction of one or more of the axes of motion. Is it any

wonder, therefore, that the human mind should possess these same axes of direction through which it acquires not only consciousness, but also the sensory perceptions which enable it to be conscious of things and happenings about it?

Herewith is a list the various dimensions in nature brought into being through the phenomena of precession:

(Space)	(Length)	(Breadth)	(Depth)
(Motion)	Translation	Vibration	Rotation
(Inward)	Gravitation	Stabilization	Precipitation
(Outward)	Radiation	Liquefication	Vaporization
(Atomic)	Radio-Active	Chemical	Electrical
(Chemical)	Ignition (Fire)	Flame	Light (Heat)
(Electrical)	Current	Wave	Magnetism
(Inanimate)	Solid	Liquid	Gas
(Creation)	Creation of Life	Growth	Senses
(Animate)	Fertilization	Male	Female

These are some of the dimensions in nature that explain the processes of creation, growth, evolution and consciousness.

The mind acquires its senses of direction from nature, just as all forms of energy do. These senses of direction were suggested by Pythagoras and Euclid—they are an innate part of the human brain. It is because of these innate senses of direction derived from nature, that the mind invariably tends to dimensionalize space, and it is in the same manner, although we may not be conscious of it, that the mind invariably tends to dimensionalize time, and the senses as well. Once the significance of the dimensionalizing that goes on in the human mind, has been accepted, the dimensions of time and the dimensions of sense may become just as real and perceptible as the dimensions of space.

When thoughts turn from one subject to another subject, the axes of the human brain can be assumed turn just as when the pointer of a compass changes from one direction to another. In the same manner, when the intensity of the mind changes, the axes of the mind change their direction, so that when we become angry, the axes are turned from their more normal position, just as when substance vaporizes or ignites. The changes in the direc-

tions of the axes of the mind are considerably more flexible, however, than the axes of energy They do not necessarily make a complete precession from one to another, they may just change a few degrees to bring about a slight change in position which will make a different impression on the mind This we have termed conformation, in contrast to a complete change in sense bringing about an opposite or new trend of thought which we termed conversion

Dr William Wightman in "The Growth of Scientific Ideas," states

> Aristotle sought the reason and the purpose of the motions of water, fire, wind and stars Galileo, recognizing the too ambitious nature of this quest, was content to demonstrate how particles of matter move in the absence of all complicating circumstances In this he was remarkably successful, but we must not make the mistake of supposing that the answer to Aristotle s question can be obtained by merely extending the application of Galileo's method, something essential to the former inquiry has been left out

The thing that has been left out is the co ordinate sense, which Wightman refers to as a relationship, as he states

> In point of fact, in reducing his description of the behavior of bodies to relationships between space and time, Galileo has reverted to a mode of thought earlier than that of Aristotle, namely that of Pythagoras for neither space nor time is a thing but a relationship expressed by a mere number, though of course the number which refers to the space is to be distinguished from that which refers to the time

Aristotle believed with Plato in the cyclical process of life and death He believed that a true rational pattern requires a moral explanation, not merely a physical one These men felt that life was more than a purely material and temporal existence They believed there must be a divine director or guide for the destinies of life

Aristotle was convinced that the soul or psyche was the central idea of existence He was very much interested in the principle

and the causes of motion and rest. He classified time in five categories: 1. Interval between events; 2. Duration of events; 3. Moment of occurrence; 4. Rate of speed or tempo of an event; 5. The transference of events themselves. (Aristotle realized that there was more to time than just duration and succession, and while he may not have sensed the dimensionality of time, he is, I think, pretty closely in agreement with the dimensions that have been suggested:

Duration	Succession	Simultaneity	Intensity
1. Interval between		3. Moment of occurrence	4. Speed or tempo
2. Duration of events			
5. Transference of events themselves			

Heraclitus tells Plato that "this world is not a true world of reality but a world of sense and everyday perception; not a world of abiding forms, ideas, worth, and values, which is eternal, but a world of constant flux and succession, mere temporal." Heraclitus does not perceive that time, like space, is made up of dimensions in the human mind.

The world is a world of sense and everyday perception, as he suggests, but not being familiar with the dimensions of time, or the dimensions of sense, through which he acquired his sensory perception, he is unable to account for the changes in ideas, worth and value. He is not aware that with each change in the dimensions of time, there is a change in ideas, worth, value and sense, just as there is a change in sense when the dimensions of space, form, size are changed. The world is a true world of reality but Heraclitus is unable to account for the truth of the reality.

The mind is constantly in motion while awake; when it goes to sleep the motion ceases, although it may start up on its own, causing dreams. The mind is a precessing instrument which generates and changes sensory percepts into thoughts, words and deeds. It is through the orthogonality of the axes of the motions in the mind that the mind is enabled to perceive in terms of time, space and sense. The source of consciousness in the mind

is derived from the dimensionality of the axes of motion which also control the continuity and constancy of the order of nature.

J. W. Dunne in "An Experiment with Time" states:

> The moving present is the essential feature of time—in fact time is constituted by its moving present. We must admit, however, that we apply the term time to the direction or dimension of its movement. If we did not admit this, then time would be merely the present, a limitation which is both invalid and absurd. Time is an infinite number of dimensions at right angles to each other.

(Dunne truly senses the dimensionality of time but he does not explain these dimensions.)

H. George Apostle states:

> Time is an attribute of motion. Sensible matter is accompanied by the proper sensibles: Dimensions—length, breadth, depth—hard, soft, color, weight, cold, hot.

(All of which are made sentient in the human mind through senses of direction.)

The dimensions of time may be visualized more clearly by comparing them to a piece of music played by an orchestra. There is a length to the piece or score with its rhythm and tempo; a breadth consisting of groups of notes and the different sounds played by different instruments which make up the harmonics; and a depth consisting in richness, purity of tone, and intensity.

Until within recent years scientists have rested content in the belief that there is one and only one kind of time, the time by which all durations are measured. Einstein, in his theory of relativity, has come forward with the proof that there is more than one kind of time—there is a measurable time and an immeasureable time, which are relative to each other.

The dictionary defines "temporal":

1. Of, pertaining to, or, limited by time.
2. Pertaining to the present life, or this world; secular—(Of, or pertaining to the worldly or temporal as distinguished from the spiritual or eternal; specif.; a. Not under church control; non-ecclesiastical; civil; b. Not

sacred.) also transitory; temporary as distinguished from sacred or eternal.

3. Civil or political, as distinguished from the ecclesiastical (of or relating to the church).

It is quite evident that the word *temporal* as used today pertains to the worldly or measurable time in contrast with sacred or spiritual time, which is eternal.

One of the reasons people are so confused is that they have been misled, or have drifted, into the belief that anything eternal or spiritual exists outside of the realm of time. This is an erroneous conclusion which has been arrived at because people have not been taught to distinguish between temporal, and eternal time. They have not been taught that these are merely inverse dimensions of time in the human mind. Time is both motion and duration, life and existence. The essence of eternal life is time, so anything having to do with religion is conceived of in terms of the dimensions of time and motion.

The inverse spatial dimensions of the mind are the material and the universal, interpreted as the commercial and scientific. The dimensions of time are the temporal and spiritual, interpreted as the factual and religious. The precessed or directional dimensions are the practical and emotional. Religion is to science, what the spiritual dimensions of the mind are to the scientific. To be creative they must complement each other.

Our spiritual consciousness is a three-dimensional consciousness, just as our temporal consciousness is three-dimensional. Spiritual consciousness has breadth and depth to it as well as eternal duration. Without this three-dimensional consciousness, religion loses its true meaning.

People cannot live by laws alone, or philosophy; they need something more stimulating, more dynamic, to counteract laws and ethics; something which will add another dimension to their thinking, to enable them to think in terms of the spiritual and eternal, and by so doing, restore their minds to a proper balance. Without this added dimension of consciousness made accessible through the teachings of religion, death is the end of everything.

The possibility of a life after death, or a spiritual existence, no longer becomes a reality because our minds are not attuned to spiritual thinking.

When our thoughts turn to the spiritual and eternal, they function in an entirely different dimension than when they turn to the temporal. This is termed conversion. When people accept religion they become converted. Conversion is an adjustment which brings into consciousness a new dimension of time.

The human mind dimensionalizes space, time and sense in each of their three dimensions, or we might better say, each of their six dimensions, for temporal time and eternal time are merely inverse directions of the same dimension. The mind does not stop to rationalize these dimensions. They are an innate part of the human mind developed throughout the centuries and passed along from generation to generation until they have become a part of our thinking and reasoning processes.

As a rule the mind dimensionalizes time, space and sense unmindful of the categories into which they fall, with each object, form of energy, word, sign or symbol setting up in the mind definite senses of direction which are transposed into sensory percepts.

Words, signs and symbols can be classified as specific dimensions in the human mind. This is the manner in which sensory impulses are interpreted into sensory percepts in the mind.

SENSORY PERCEPTS

SPACE	—Length	Breadth	Depth
TIME	—Duration	Simultaneity	Intensity
SENSE	—Time	Space	Direction
	Motion	Distance	Velocity
	Temporal	Material	Sentient
	Eternal	Soul	Spirit
	Creation	Growth	Evolution
	Life	Truth	Love
	Meaning	Knowledge	Understanding
	Purpose	Reason	Faith

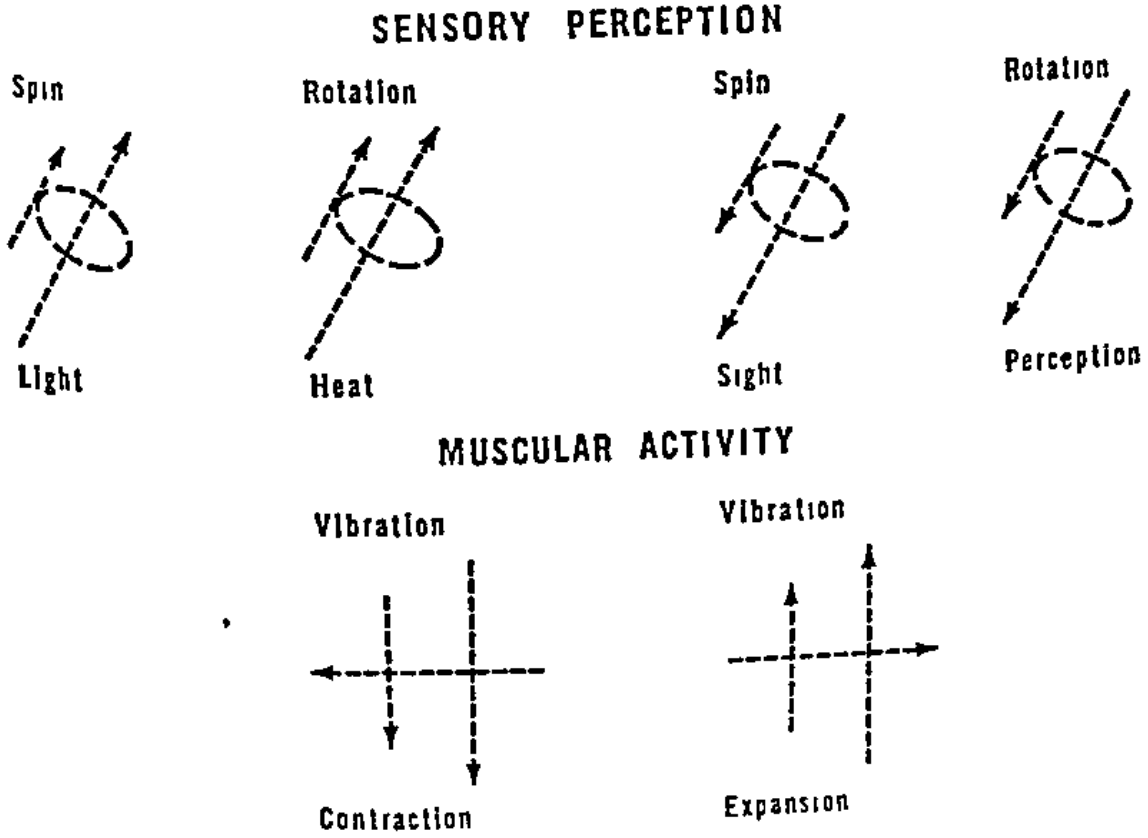


Fig 59

The senses (senses of direction) in the human mind and body are constantly changing their directions to comply with, or maybe to refute, sensory impulses received from different sources When we read a message or hear something, senses of direction are precessed at the eyes or the ears, which are transmitted to the brain where they are spontaneously precessed into sensory precepts or concepts Some concepts are spatial, bringing about reactions of attraction or repulsion, some are temporal with reactions of intensity or calmness, some are sentient, with re-actions of pain or pleasure Each reaction is a combination of all three of the sense coordinates, but at times only one of them is altered to bring about a different sensory reaction (Fig 59)

Every organism, from the lowliest atoms of inorganic matter to the cells of the human brain, possesses the three co-ordinates of existence, consisting of a sense of time, a sense of space, and a sense of direction, all of which are subject to the law of pre-cession Each element acquires certain polarities termed valences,

through which the various elements are enabled to combine and complement or supplement each other. The valence of an element is the number of axes which an element possesses enabling it to combine with other elements. It is the polarity of these axes which determines the alkalinity or acidity of elements. The vibrons provide not only for the material make-up of the body and muscular activity, but they also provide for the physical make-up of the brain and the development of consciousness in the human mind; while the rotons, on the other hand, provide for the sensitivity of the nervous system, the body temperature, our feelings and other sentient qualities.

It is through a sense of direction that we acquire our sense of sight, and sense of feel, giving us our senses of size, space and form.

True knowledge is the knowledge of truth through which the mind gains freedom of space. True understanding is an understanding of the truth through which the mind gains freedom of time. True reason requires both knowledge and understanding thus enabling the mind to turn freely in any direction. To reason clearly the mind must be exercised in both the temporal and spiritual dimensions of time, as well as the material and universal dimensions of space.

We have seen how the elements were built up from elements of a lower order to elements of a higher order. So, with the human mind. The transition of minds from minds of a lower order to minds of a higher order was brought about, first, through an increase in sensitivity which opens up new dimensions and new channels of thought in the human mind, which, when precessed and recreated in the young, establishes minds of a higher order for future generations.

CHAPTER VII

DIRECTION IN LIFE

THOUGHT IS BROUGHT into this world through the radiant momentum of the human mind. Any superior power can be conceived only within the spatial, temporal and sensitive limitations of human consciousness. Thought begins at a very slow rate of activity and gradually picks up momentum as the mind develops. As the human mind has gradually evolved to a higher order, the speed of acceleration has increased.

As the mind acquires the ability to think in terms of space, time and direction it increases in knowledge and understanding enabling the mind to function creatively with the various spheres of influence co-ordinated. Thought is the co-ordinated components of time and space functioning in a certain direction of momentum. It is the co-ordinated energy of the atoms and molecules of the brain and the body grouped together creating a personality. It is even greater than that, it is the co-ordinated energy of the mental, physical and spiritual ability of all the people, here and abroad, past and present, stored within the human mind and body for the purpose of promoting a higher form of life here on earth.

Human thought is utilized not only to improve the human mind and body, the ultimate aim of all finite energy, but it is also used for improving and developing the necessities of life. A chair, table or bed was each conceived in the human mind before it was produced as a finished article. When a carpenter builds a chair, he first figures out in his mind how the chair should be built, then he fashions the chair accordingly. When the chair is completed, it becomes a proven truth. If the chair

is not properly fashioned or is constructed with inferior materials to those the carpenter had in mind, it does not become a truth, it becomes a falsity.

Everything that is fashioned from concepts in the human mind is fashioned as true or false, whether it be a chair, a bed, a piece of machinery or a form of government, religion or education. Not everyone can be a carpenter. People have to rely upon the honesty and integrity of the carpenter to produce the truth as he sees it. When he produces false articles, he not only betrays his customers but he also betrays his own mind. He destroys the faith of his customers in him and faith in himself.

The manifestation of faith in one's self and in others is one of the most important factors in all human progress. Faith is a manifestation of the spirit of truth. As the mind gains in the knowledge of truth, it gains in strength; as it is deceived by falsehoods, it loses strength. As the mind gains in strength, an increase in sensitivity is required to enable it to function properly. This increase in sensitivity enables the mind to understand better. As the mind gains in knowledge, it is released from the spatial restrictions. As it is increased in sensitivity, it is released from its temporal restrictions. The freedom of the human race is linked up with the acquisition of knowledge and the development of a higher degree of understanding.

The human mind develops through a series of valences similar to the valences of the elements. The mind starts life as a monovalent, develops to a bivalent, then to a trivalent and on up to a multivalent at which time it begins to recede back to a bivalent and univalent. Each step in the process brings about a change in the reasoning power of the individual. Each step develops the mind to a higher order but it does not become stabilized at this higher order unless precessed through parturition from generation to generation, even to the third, fourth and fifth generations. As each generation progresses, the mind is precessed in a shorter period of time. This is an important factor in the advancement of civilization.

Man has learned to control the forces of nature through the

development of mechanical, chemical and electrical energy to the extent that he can move mountains, construct great highways and waterways, build harbors with cities reaching to the skies and devise ways and means for splitting the atom

Man may think of himself as the creator of energy He is endowed with the ability to direct those processes through which energy is created, but man does not of himself create energy, he merely sets up the conditions and directions under which energy functions and in many instances controls the functioning of that energy even to its starting operating and stopping

Man not only controls the functioning of certain forms of energy but he also has complete supervision over the way in which that energy shall be used It may be used for constructive purposes or destructive purposes, whichever man chooses It can be used against the interests of others, or it may be used to the benefit of humanity

Certain definite laws concerning the starting, functioning and stopping of energy have been established, laws concerning the release, perpetuation and stabilization of energy, concerning the chemical, electrical, mechanical, and thermal qualities and many other attributes of energy

Louis DeBroglie in his recent book, "Matter and Light" states

> The special characteristic of the important new theories of contemporary Physics, both the Theory of Relativity and the Quantum Theory, is a stupendous effort to enlarge the limits of thought, and to shake off certain a priori concepts which certain natural phenomena refuse to fit The Theory of Relativity, in the first place has again set a question mark against the old concepts—concepts so aptly fitting immediate intuition—of absolute Space, Length and Time It has shown that ultimate Reality consists in a kind of intimate union between Space and Time, and that the way in which we carve out our time and our space from this baffling Reality has no more than a relative validity, and depends on the reference system to which we happen to be attached Even more boldly, the Quantum Theory gives up the notion of the continuity of physical phenomena in its attempt to interpret phenomena which in appearance are inexplicable, and seeks a solution of

the riddles of the atomic world by approaches of a strange novelty Whatever may be the future fate of these theories, they are in any case splendid intellectual efforts They are efforts which have not only brought new life to physics, but have also brought fresh food to philosophic thought by asking some of the great traditional questions in an unexpected form for example, by raising again the entire problem of Causality and Individuality

Nikolus of Cusa (1401-1464), one of the first to discuss the nature of time and space, held that these co-ordinates are products of the mind, and thus they are inferior to the mind that created them

Giordano Bruno (1546-1600), discussing time and space in their astronomical aspects, argues that the words "above," "below," "at rest," "in motion" become meaningless in the world of eternally revolving suns and planets which know of no fixed center

William James in his "Psychology," states "The quality of voluminousness (space) exists in all sensations, just as intensity (time) does"

Sir James Jeans in his "Physics and Philosophy," states

> We find there is something in reality which does not permit of representation in space and time Thus space and time can not contain the whole of reality, but only the messages from reality to our senses

Although the dimensions of space may be familiar to us, it is not clear how such dimensions are made perceptive Perception itself is a sense of direction in the human mind Both the sense of space, and the sense of time are made perceptive to the human mind through senses of direction Without the orthogonality of the dimensions of time, everything would be a heterogeneous nothingness as conceived by some of our earlier philosophers

Anaximander (611 547 B C) believed the world to be an endless limitless unregulated mass of primeval chaos (It would be if it were not for the senses of direction which bring order out of chaos)

Democritus (470 B.C.) conceived of motion as eternal. He developed the idea of the atom which he inherited from his teacher Leucippus. He attempted to explain the phenomena of nature quantitatively, not qualitatively. (A line of reasoning still favored by some scientists.)

Man has learned to direct the flow of water over a water-wheel to produce hydraulic power; to direct the flux of a magnet through an armature to create an electric current; to direct the forces of steam and gases through cylinders to produce the power of the steam and gas engines.

Each step in directing the flow of energy has been a big step in developing the truth of the knowledge of matter and energy. Along with each step, a new form of reasoning was perfected through which the truth of these forms of energy could be computed. With each new step came new laws of physics which were simplified into mathematical equations for determining values.

1=1 is merely a thought reaction in the human mind. Two trees or two houses may appear to be equal but the equality is the result of a mental process. Each tree grows and each house is constructed in accordance with definite laws which make the two objects equal in so far as the human mind is concerned, whereas, actually, there is no relationship between the two objects except in the human mind. This is a simple truth of human reason which the mathematician must accept before he can proceed with any degree of certainty.

In the same manner two chemical or electrical reactions appear equal to the human mind whereas each is a definite reaction by itself with no relationship to the other reaction except in the human mind.

The symbols plus and minus may represent thought processes in the human mind or they may represent the reality of two objects placed together or one object removed. The plus symbol is used to designate positive electricity which is generally accepted as the downward or inward direction of counter-clockwise energy, while the negative symbol designates the upward, out-

ward or clockwise direction of energy These are merely the acknowledged symbols of opposite directions of energy

Likewise, the symbols multiply and divide may produce mental pictures or they may represent realities as in chemical reactions The uniting of two chemicals may produce a physical combining or a physical division of the two When they combine to form a new compound, they combine through chemical multiplication, when one is broken up and absorbed by the other, it is chemical division

Ptolemy (A D 139) conceived of the earth as the center of the universe around which the heavenly bodies revolved in circles at a uniform rate (We see here another concept of the directions of motion of the heavenly bodies quite different from the one offered by Pythagoras (582 B C) Ptolemy thought of the heavenly bodies as encased in separate crystalline balls, nine in all, which moved around the earth The larger spheres he termed eccentrics, the smaller spheres epicycles)

After Ptolemy came the Dark Ages, which lasted until around A D 1500 Little scientific progress was evident during this period Some improvements were made, however, in mathematics and physics, and it was during this period that Arabic numerals were introduced

St Thomas (1226-1274) reaffirmed the Aristotelian definition of time as a measurement of motion He propounded the concept that God knows all things at once, that all things at once were made completely eternal

Copernicus (1473 1543) represented the sun to be at rest in the center of the universe around which the earth and the moon revolved, that the earth revolved around its axis, as well as a rotating motion in its orbit, and that it is possible for the earth to have several directions of motion He explained the variations of the seasons To account for the different directions of motion of the solar system he introduced a system of epicycles resembling that of Ptolemy This arose from the questionable notion of his time that all motions must be compounded of circular ones

Galileo (1564 1642) advanced the theory that all falling

bodies great or small descend with equal velocity, thus establishing a relationship between time and space He discovered the isochronism of the pendulum, and developed the idea that actions and reactions are equal and opposite He explained that planets changed their direction but not their rate of motion, hence the only force required is a centripetal one (radius vector) deflecting their pathways inward towards the sun, and this centripetal force must be equal to the centrifugal force (rotation) that resists the inward pull

Galileo states

> When I conceive of a piece of matter or corporeal substance, I conceive that in its own nature it is bounded and figured in such and such a figure, that in relation to others it is large or small, in this place or that place, in this or that time, in motion or at rest— in short, by no imagination can a body be separated from such conditions, so if the senses are not escorts, perhaps the reason or the imagination by itself would never have arrived at them

Here again the challenge is thrown out that time and space are always accompanied by the senses, but just what he means by the senses is not clear because the relationship of the senses to direction has never been established

Concerning time, Galileo states

> We compare motions with one another by the use of time as an intermediary Time is measured by the motions that are observed round about us by the senses and which underlie our experience

Isaac Barrow (1630 1677) states

> Time is an intermediary between movements We compare some motions with others by the medium of time, a unique and steady flow Temporal measure is only estimated by spatial quantity

There can be no actual time without space Neither can there be a sense of time or a sense of space without direction

Liebnitz (1646-1716) was careful not to identify space with matter or time with motion, but he insisted that, though different, space is inseparable from matter or time from motion

Leibnitz states

> Space and time exist only relative to objects, and not in their own right; space is only the arrangement of things that exist and time an arrangement of things that succeed one another

By referring to "objects" and "things" he is confusing the spatial and temporal

Huygens (1629-1693), the originator of the wave theory of light, conceived of light as a form of motion in the medium through which it passed (Rather than just a form of motion, light is a sense made perceptible through the senses of direction and motion of the axes of the atoms in the atmosphere).

Count Rumford (1753-1814) revived the old idea of Boyle, that heat is not a material fluid, but merely a mode of motion or vibration among the particles of ponderable matter. (According to Kotaro Honda, as heat increases the sense changes over from an axis of vibration to an axis of rotation)

Sir Humphrey Davy (1778 1829) states

> Heat is a peculiar motion, probably a vibration of corpuscles of bodies tending to separate them

(The concept here again is limited to vibration)

Thomas Young brought forward for the first time (1801) convincing proof of the undulatory theory of light—the theory which holds that light is not a corporeal entity, but a mere pulsation in the substance of an all pervading ether He suggests that light differs from heat only in the frequency of its undulations and vibrations (Light is a sense of radiant motion, the sense of light itself being created by the senses of direction in the atoms of the atmosphere, and heat being generated not so much because of a change in velocity, although there may be a change in intensity, but more because the axis of translation gives way to an orthogonal axis of rotation)

Young states

> To say that light undulates is to postulate something that undulates, and this something could not be air If not air, what then? Why, clearly, something more intangible than air, something 'supersensible' evading all direct efforts to detect it, yet existing everywhere in seemingly vacant space, and also interpenetrating the substance of all transparent liquids and solids, if not, indeed, all tangible substance This intangible substance Young rechristened the 'Luminiferous Ether'

What he terms ether or luminiferous ether could be senses of direction made up of the axes of the protons and the electrons

which are present in abundance in every atom and molecule, and which exist even in empty space. It is the relative positions, senses of direction, and directions of motion of these axes which create the sensible qualities of matter and energy.

In the early days Young thought of these undulations as longitudinal—forward and backward pulsations. In 1818 Fresnel demonstrated that the undulations are not longitudinal, but transverse. It so happens that ordinary fluids cannot transmit lateral vibrations, so it becomes necessary to assume that the luminiferous ether is a body possessing elastic rigidity. It may not be a body at all, but rather a combination of senses of direction which of themselves have no bodies or velocities but make up the axes of the atoms of space which transmit and translate (precess) various senses of direction.

Would not empty space be an ideal medium for the precessions of the senses of direction, especially the sense of translation through which the senses of light and gravity are transmitted, while the abundance of these senses in the atmosphere are ideal media for the realization and execution of these senses?

F. A. Trendelenberg (1802-1872) states:

"The motion of time is not a-priori, but is derived from motion."

H. R. Lotse (1817-1881) states:

"To represent time we need a 'sense' to the line."

Maxwell's Theory of Light—Light is merely an electro-magnetic disturbance of the ether.

The Lorentz Theory of Light—Changes in the velocity of light in moving media accounted for by the modifying influence which the electrons in the moving media have upon the propagation of electro-magnetic disturbances, rather than a dragging along of the ether itself, account for the light.

Henri Bergson (1859-1941) states:

> I believe that metaphysical problems will resolve themselves with a wider knowledge of the "phenomena of consciousness." Philosophy is founded on the belief that life is the true being or essence of things.

Immanuel Kant (1724 1804), a German metaphysician, proposed the solution that time and space have no real existence, but are only forms of human perception This is similar to the concept of Nikolas of Cusa It is possible, however, that the particles of space, the motions of time, and the senses of direction did exist before human perception developed It took centuries for the present animate senses of direction (consciousness) to evolve from inanimate senses of direction

Sir Isaac Newton (1642 1727) tacitly assumed that space and time were no mere dependents on consciousness but existed in their own right, and introduced the hypothesis that absolute measures of space and time, at least in principle, were possible He states

> It is quite simple to discuss space and time separately Mathematicians have investigated the properties of the universe in which space is finite and time infinite, and no logical inconsistency has so far been detected in the concept

Time and space must have existed in their own right whether or not we were here to recognize them or even be conscious of their existence Time and Space would still exist in their own right even if we never existed, but without a sense of direction through which the sensate qualities of matter take form and are made manifest there could be no matter or energy

Our year is based by the time it takes the earth to make one complete revolution around the sun The month is based upon the rotation of the moon about the earth Days, hours, minutes and seconds are based upon the rotation of the earth on its axis It is through the angles of direction of the sun from the earth due to the rotation and translation of the earth that we measure time

The Northern and Southern Hemispheres of the earth have a change in season every six months due to the change in direction of the sun s rays in each hemisphere Though the earth is nearest the sun during the months from October to May, the Northern Hemisphere is coolest during this period because of the direction of the sun's rays The intensity of the sun s rays varies not only proportionately to the distance of the sun from the

earth but also proportionately to its angle of direction from the meridian

The measurement of motion, whether through an arc of 360 degrees of any other direction of motion, forms the basis for the measurement of time, just as measurements in feet and inches form the basis for the measurements of distance Most clock and sundials impart their meaning through an angular measurement of direction

Time is defined (1) "The period during which an action, process, condition or the like, continues" This might be considered as a definition of absolute or abstract time Then the dictionary goes on "The interval between leaving and returning" Here direction is brought into the definition It is justifiable because it helps to clear up, in our minds, what we mean by time, but by bringing in the co ordinate direction—leaving—returning—time is removed from its abstract and expressed in terms of sensate direction Whenever direction is brought into the definition, time and space can no longer be considered abstract They become sensate—sense and direction being synonymous

Without the sensate quality of direction, there could be no matter or energy in any form And, while the sensate qualities of the human mind are of a much higher order then the sensate qualities of inanimate matter, they both spring from a co-ordination of the spatial, temporal and directional components which serve to make up the properties and qualities of all forms of energy

Let us next look into some of the definitions of space where we will also find confusion concerning absolute space and sensate space

> Space is that which is characterized by extension in all directions, boundless, and indefinite divisibility, that in which all physical things are ordered and related at one time (or apart from time), the subject of determinations of position and direction

When a point is extended, it takes on the sensate quality of a line of direction, unless extended in all directions, in which case it becomes expansion

Alfred Daniell states

> When a single point moves it describes a line if it travel by the shortest distance between two points, its path is a straight line; and a straight line is an example of space of one dimension Move ment and measurement may be effected in a forward or a back ward direction along it, but as a line has neither breadth nor thickness there can be no other A plane surface has length and breadth but no thickness, and is therefore said to be space of two dimensions A solid has length, breadth, and thickness, and is said to occupy space of three dimensions

So, getting back to our dictionary, we see that the definition is referring to sensate space, not abstract space, in the first sentence, then it jumps over into a definition of abstract space "boundless, and indefinite divisibility"

Next it jumps back into sensate space "that in which all things are ordered and related, the subject of determinations of position and direction"

The definition continues

> Actual space has long been regarded as being of three dimensions according to ordinary or Euclidean geometry, but experiment sup ports the theory of Einstein that it is non Euclidean and that the presence of matter gives it a slight warp in a fourth dimension According to this, space (like the earth's surface) is boundless but not infinite in extent and a ray of light traveling a sufficiently long time (estimated by Einstein as 500 billion years) would return to its starting point In recent physical and philosophical theories the conception of space cannot be separated from that of time

This is quite a profound statement so we will take it up step by step In the first place one can readily see that in the theory of relativity, time, space and direction are all linked together in one bundle so there can be nothing abstract about it The theory of relativity is a theory of relative forms of energy, each form of energy being composed of the three co-ordinates—time, space and direction

The statement that all energy has a slight warp or curvature merely confirms the fact that all energy must have three axes on which to function, and it is the axis of rotation which gives to energy its slight warp or curvature

Space in the abstract does not have dimensions, it has only roundness and fulness or emptiness When space is given dimensions it is changed from abstract to sensate space We today consider space in its sensate sense

Einstein has introduced the theory of relativity in which sensate space and sensate time are linked together in one package, again setting a question mark, as DeBroglie puts it, against the old concepts of absolute space and time

Or, as Niels Bohr puts it,

> Any observation which introduces the concept of sensory perception necessitates an interference with the cause of phenomena, which is of such a nature that it deprives us of the foundations underlying the causal mode of description
>
> The limit which nature has herself thus imposed upon us, of the possibility of speaking about phenomena as existing objectively, finds its expression, as far as we can judge, just in the formulation of quantum mechanics However this should not be a hindrance. We must be prepared for the necessity of an ever extending abstraction Above all, we may expect new surprises in the domain where the quantum theory meets the theory of relativity

In another article on the Notions of Causality and Complementarity, Niels Bohr states

> In fact any attempt at locating atomic objects in space and time demands an experimental arrangement involving an exchange of momentum and energy, uncontrollable in principle, between the objects and the scales and clocks defining the reference frame
>
> Conversely, no arrangement suitable for the control of momentum and energy balance will admit precise description of the phenomena as a chain of events in space and time
>
> The very fact that quantum phenomena cannot be analyzed on classical lines thus implies the impossibility of separating a behavior of atomic objects from the interaction of these objects with the measuring instruments which serve to specify the conditions under which the phenomena appear
>
> We are forced with the necessity of a radical revision of the foundations for the description and explanation of physical phenomena

(May not this radical revision be the recognition of direction as the third co-ordinate of existence?)

The dictionary continues

Since the advent of the relativity theory many physicists attribute to space such properties as would enable it to transmit gravitational and electrical forces, light, etc, without the need of an ether

The question whether space is real apart from space filling objects, that is, whether it is a receptacle for things or an attribute of them, dates from early times The antithesis of these two views is complicated in modern discussions by the questions of the subjective (ideal) or objective (noumenal) reality of space Many theories have been advanced First, according to common thought, space is real, a (Noumenal) receptacle, intrinsically void, this was Newton's view Second, space is the essence of bodily substance (Descartes' conception), or an attribute of substance (Spinoza) Third, space is a mental construction due to gradual co ordination of sensations, especially of sight and motion, this was Berkeley's view and the usual conception of many 19th Century psychologists It is held in two forms, some authorities maintain that space is merely a product of the co-ordination of sense experience, others that it is a quality of sensations themselves Fouth, space is an a priori form into which sensuous experience necessarily falls, this was the Kantian view A fifth view maintains the existence of two kinds, distinguishing the ideal, or a priori form of space from real or physical space, and admitting both Mathematical space is to be distinguished from the foregoing

Anstotle (Physics, Book IV) held the view commonly accepted in modern times of space as the logical condition of the existence of bodies, space being "that without which bodies could not exist, but itself (space) continuing to exist when bodies cease to exist', space possesses magnitude, though itself is not a body—"for in case it were a body then two bodies would exist in the same place' He urged that enclosed places may be contained and moved in larger including places—"a ball in a box, the box in a house, the house in a town, the town on the earth, but all places are in one continuous space, an ultimate environment, (peras), which contains all movable things and is not movable itself

Riemann states

Space itself is nothing more than a three dimensional manifold devoid of all form, it acquires a definite form only through the advent of the material content filling it and determining its metric relations Our century has given experimental proof of the existence

of the atom, but has not been able to fathom in the same way the exact form or nature of this ultimate particle of matter

Bergson stated

> Possibly you mathematicians have not noticed that every observer is perfectly aware of a separate space and time wherever he goes, just as he is aware of a separate space and temperature Were space and time one sole continuum, as you maintain, we would never be aware of space and time separately, but only of space time This is contrary to the facts Hence, space-time is a hoax, and your mathematics has led you astray

Bergson claimed that the human mind invariably spatializes time This might better be stated —The human mind invariably dimensionalizes time—thus linking time to direction as well as to space

Minkowski proved that, contrary to the belief of classical science, the world has a four-dimensional "metrical" continuum, i e , one with which a four dimensional space and time geometry is associated It was this novel aspect of the world that implied the revolutionary conception of the fusion of space and time And it was this aspect that entitled Minkowski to speak of time as a fourth dimension in a profound sense as well as in the trivial sense which, though never disputed by classical science, was never stressed on account of its artificial nature

Professor Broad, in his book, "Scientific Thought," informs us

> No matter what frame we choose, we shall need four independent pieces of information to place and date any instantaneous point-event This fact is expressed by saying that Nature is a four dimensional manifold In whatever frame we choose we shall find that our four pieces of information divide up into two groups, three of them are spatial and one of them temporal Thus we must be careful not to talk, to listen to, nonsense about time being a fourth dimension of space What we should say is that, Time is a fourth dimension of the space time manifold'

(And while time may be a fourth dimension of the space time manifold, it is only a third dimension of the space-time sense manifold, the manifold of conscious dimensions)

> Professor Albert Einstein advocates the physical theory of relativity which suggests that physical space and physical time have no separate and independent existence; they seem more likely to

be abstractions or selections from something more complex, namely, a blend of space and time which comprises both

Einstein made no mention of the probability that physical space and physical time can be joined together only through their axes of direction, which he refers to as a blend of space and time How can time and space be blended together if they have nothing to hold them together? They are held together through the senses of direction which are symbolized by Einstein in his mathematical signs

Time is conceived in the human mind as a uni-dimensional current with a certain velocity It was pointed out by Kotaro Honda, the Japanese scientist, that each atom of a solid vibrates about its mean position with three degrees of freedom In other words, each atom has three axes about which it functions One axis is this axis of vibration about which the atoms vibrate at normal temperatures or velocities When the temperatures or velocities are stepped up, the axes of the atoms are precessed from an axis of vibration to a perpendicular axis of rotation causing the element to melt, each molecule functioning on its own independent axis When the temperatures or velocities are stepped up still further, the axes of the atoms are precessed to a third orthogonal dimension of translation along which the atoms ignite and separate into waves of fire and beams of light

Instead of going through the chemical processes of melting, vaporizing and igniting, the human mind merely changes the directions or senses of directions of the axes in the mind to con form to the senses of direction of the forms of energy, but the human mind does not go through the chemical reactions, it merely sets up a sensory reaction in the mind termed *sensory perceptions* In other words the human mind recognizes that matter melts, vaporizes and ignites, and while it does not neces sarily associate these reactions with any particular sense of direc tion, it is enabled to sense these various reactions simply because of the nature of the reaction—the precession of the axes

The characteristics of all matter and energy are made realities in the human mind through the precessions of the axes in the atoms of the brain which are made to conform with the senses

of the axes of matter and energy through the senses of sight, feel, taste, smell and sound. As the rate of acceleration increases from vibration to rotation to translation, the senses of direction in the brain are precessed, thus enabling the human mind to comprehend what is going on.

The human brain is not limited to the three orthogonal dimensions of space; it is also cognizant of the three orthogonal dimensions of time, and the three orthogonal dimensions of the senses themselves. It is possible to have a change in sense without any apparent change in quantity, form, or velocity. This is the outstanding quality of the animate mind, in contrast with the sensitivity of inanimate matter.

The sense of feel, like the sense of sight, gives a sense of direction, so that when we feel a table, a ball or a block, we can tell by the sense of feel whether or not the ball is round, the block is square or the table is oblong. We can distinguish physical objects just as clearly by the sense of touch as we can by the sense of sight if obliged to distinguish objects that way. The blind can distinguish objects and their physical texture more clearly and distinctly through their sense of feel then others do through their sense of sight.

All sensory perceptions are senses of direction even to the spatial qualities of size and distance. The only way in which we can determine size is through the angular sense from our eyes or the angular sense we get from our finger tips or the angular sense we get from measurements which we associate with other angular measurements.

When this sense of direction strikes the eyes, the finger tips, the ears, nose or tongue, it is relayed by precession through the nervous system to the brain, where it becomes a percept. The brain learns to distinguish the various senses of direction and catalogues them each in terms of sensory perceptions.

The different sections of the brain receive these sensory impulses and relay them to other sections of the brain where all of the different impulses are translated from senses of direction to sensory perceptions. The resultant may be purely a mental reaction or this mental reaction may cause a sense of direction

to be sent to one or more of the body muscles causing them to act in certain directions

Memory is the ability of the mind to repeat certain sensory impulses which originally came from outside of the mind, or they may originate within the mind as creative thought Some people have minds with great retentive powers for outside impulses, others have minds with great creative ability Some, but few, have both

Bertrand Russell states

> It has turned out that (under the assumption that modern mathematics is consistent) the solution of certain mathematical problems requires the use of assumptions essentially transcending arithmetic, i e, the domain of the kind of elementary indisputable evidence that may be most fittingly compared with sense perception Furthermore, it seems likely that for deciding certain propositions of abstract set theory and even for certain related questions of the theory of real numbers new axioms based on some hitherto unknown idea will be necessary Perhaps also the apparently insurmountable difficulties which some other mathematical problems have been presenting for many years are due to the fact that the necessary axioms have not yet been found

The sense of direction is the co ordinator through which time and space are joined together for the creation of energy It is through co-ordination of space and time that the sense of direction is brought into play Without space and time there could be no sense of direction, and without a sense of direction there could be no co ordination of space and time Without senses of direction there would be no uniformity, continuity, or purpose in the world

While the term *energy* does not necessarily imply direction, the creation of energy, its functions and transformations, can be explained only through the semantics of direction which have been incorporated into our language and the mathematical signs which we employ

Scientists have realized for years that there must be something which regulates and controls the formations, motions and reactions of energy and matter to make them uniform and consistent. They recognize that each element has its own melting, freezing

and boiling points, its particular reactions of fusion and fission for combining with and separating from other elements, that energy can be transformed from mechanical to electrical and chemical energy, and vice versa, and over and above these, that the human mind and animal minds tend to react in certain definite directions toward certain stimuli Every animal that roams the forests, every fish in the sea, each grain of sand and drop of water, is endowed with certain senses of direction peculiar to itself If it were not for these senses of direction, these different animals and particles would not possess the degrees of sensitivity peculiar to themselves They would not react as a normal animal, fish, grain of sand or drop of water should

It may take some time yet to adjust our minds to this new, simple method for solving many of our most baffling problems, just by resolving them down to their proper dimensions of time, space and sense, but it is bound to come

Each form of energy has been given a name by which it is distinguished Not only does each form of energy make a different impression on the human mind, but each name given to these various forms of energy creates a different impression because of the forms of the symbols used to make up the words, so that observing the form of energy, reading the written word or hearing the spoken word gives the same impulse to the human mind

As the human mind has gradually developed to a higher order it has developed a keener sense of discrimination and conformation, while the tempo of consciousness has been stepped up As we learn to think in terms of time, space and direction, we increase in knowledge and understanding enabling our minds to reason and function creatively with the various spheres of thought co-ordinated It is this co-ordinated energy of the atoms and molecules of the brain and the body grouped together which creates a personality Yes, it is even greater than that—it is the co ordinated energy of the mental, physical and spiritual ability of all the people, here and abroad, past and present, stored within the human mind and body for the development of a higher form of life

As the mind gains in the knowledge of truth it gains in strength; as it is deceived by falsehoods it loses strength. As the mind gains in strength an increase in sensitivity is needed to enable it to maintain an equal balance through which to recognize the truth.

If the essence of life is time, then to make time a reality it has to be accompanied by the substances of space and the senses of direction to give it reality and make it perceptible to the human mind.

Distance and depth can be made percepts in the human mind only through the orthogonality of the senses of direction. Images are made sensitive to the eyes through the senses of direction of the light striking the eyes. It is the beams of light striking the eyes at different angles which enable us to distinguish depth. If we did not have two eyes with which to distinguish between the two angles of light, we would lose our sense of depth, the third dimension of sight.

But we have other senses through which we are enabled to perceive depth. We can perceive depth through the sense of feel and by measurements. Here again it is the sense of direction relayed to the mind from the finger tips or the measuring rod which enables us to perceive depth.

All sensory percepts are made percepts in the mind through the sense of direction. Some percepts are conveyed more clearly through the sense of sight, some through the sense of feel, some through the use of measuring devices, some through the senses of sound, taste or smell, and some through the senses of direction alone which the mind either remembers or originates. All percepts are made real to the human mind through an innate sense of direction.

If it were not for the senses of direction innate in our minds and bodies we would not be able to perceive of form, size, distance, direction, hot, cold, light or color. And if it were not for the senses of direction in inanimate matter and energy, there would be no uniformity of action or appeareance and there would be no consistency in the world.

CHAPTER VIII

DIRECTION IN MATHEMATICS

KANT INSISTS THAT mathematical discovery is not a mere matter of analysis It always involves a synthetic element, even the result of a simple sum is not gotten by analysis, but by *counting* or some kind of *construction*

Edward A Maziarz in his "Philosophy of Mathematics," states

> The main difficulty of understanding quantity as the formal object of mathematics, of course, lies in realizing that substance and quantity alone do not exist as such and as separated from qualities in nature, but only as conceivable and abstractible by the mind
>
> Pre-scientific knowledge and the use of the senses and the imagination are principles from which mathematical abstraction arises The very concepts which are employed in mathematics—structure, order, relation, domains, inclusiveness, greater, upper bound and countless others—are eloquent testimony to the fact that unless one had personally or vicariously learned what structure, order, related ness, inclusiveness and so forth, are, he would not be able inventively to attribute these qualitative states to the mathematical natures in the mathematical universe

Algebra deals with the fundamental operations of addition, subtraction, multiplication and division, raising to powers and extracting roots, hence it is the basis of all work with numbers disguised as abstract algebraic expressions But these expressions are not quite so abstract as we have thought them to be They might be considered abstract if we were not aware that the co-ordinate direction is brought into these equations through the use of our mathematical signs Every mathematical sign is a symbol for direction It is the co-ordinate which represents

either a direction of motion, a position, or a sense of direction

The theorems of geometry are not accepted as such simply because they have been proved valid by deduction The fact that the theorems of geometry agree with experience is accounted for by the agreement of its axioms and elements with experience and by the use of exact reasoning in which direction plays a leading role

It is by means of the sense of direction precessed orthogonally to the sense of time and the sense of space that the sensitivity of all forms of matter and energy, even to the energies of light, heat, gravity and precipitation, are enabled to function properly, and are made perceptive to the human mind

An article appeared recently in one of the scientific publications titled "How to See Depth," stating

> Your two eyes see depth or distance between two objects in two different ways The image you see with your left eye is slightly *different from the one seen by the right eye This is true because* your two eyes are looking at the object from two different angles The other kind of depth perception is a much more vague experi ence It tells you only that one object is nearer or farther away from the other, but not how much It depends not so much on ana tomical organization alone, as on your previous experience in judging distance and depth

To substantiate the proof of mathematical direction, the planet Neptune was discovered through a mathematical equa tion which has since been accepted as a method of scientific prophecy No one suspected the existence of trans Uranian planet till Uranus itself, by hair breadth departures from its pre dicted orbit, gave out the secret No one saw the disturbing planet, Neptune, until the pencil of the mathematician, with almost occult divination, had pointed out its place in the uni verse The general prediction of a trans Uranian planet was made by Bissell (1840), but the analysis that revealed its exact location was not undertaken until half a decade later by two independent workers In 1846 Leverrier, after laborious mathe matical calculations, requested the Berlin observatory to search

for the disturber of Uranus in a particular spot in the heavens When Dr Galle, following these instructions, turned his tele scope to the indicated region, there, within a single degree of the suggested spot which had been determined mathematically, he saw the star henceforth to be known as Neptune

Pierre S Laplace (1749 1827), French Mathematician and Astronomer, applied himself to the problems of celestial me chanics which earned him the title of "The Newton of France" In 1776 Laplace announced his celebrated conclusion of the invariability of planetary mean motions, carrying the proof as far as the cubes of the eccentricities and inclinations This was the first and most important step in the stability of the solar system It was the first of a series of profound investigations in which Laplace together with his contemporary, Lagrange, sup plemented each other in assigning limits to variations of the several elements of the planetary orbits Laplace's declared aim was to offer a complete solution of the general mechanical prob lem presented by the solar system, and to bring theory to coin cide so closely with observation that empirical equations should no longer find a place in astronomical tables The first part of his work contains methods for calculating the movements of trans lation and rotation of the heavenly bodies, for determining their figures, and resolving tidal problems

Laplace was the first to offer a complete analysis of capillary action based upon a definite hypothesis—that of forces, "sen sible only at insensible distances" It was a favorite idea of his that chemical affinity and capillary attraction would eventually be included under the same law, and it was perhaps because of its recalcitrance to this cherished generalization that the un dulatory theory of light was distasteful to him By his discovery that the attracting force in any direction of a mass upon a particle could be obtained by the direct process of differentiating a single function, Laplace laid the foundation for the mathe matical sciences of heat, electricity and magnetism

The theory of probability, which Laplace described as "com mon sense expressed in mathematical language," (the language

of direction) engaged his attention from its importance in physics and astronomy; and he applied his theory, not only to the ordinary problems of chances, but also to the inquiry into the causes of phenomena, vital statistics and future events.

Newton realized the importance of direction in formulating his laws of motion:

1. Every body continues in its state of rest or of uniform motion *in a straight line*, except in so far as it is compelled by force to change that state.

2. Change of motion is proportional to the force, and takes place *in the direction* of the straight line in which the force acts.

3. To every action there is always an equal and *opposite* reaction; or the mutual actions of any two bodies are always equal, and *oppositely directed, along the same straight line.*

With these laws as a basis, the mathematician makes his drawings, indicating the magnitude by the length of the line, the direction by the angle of the lines starting from the same point, and the sense of direction by the arrowheads. In this way he formulates his equations for the geometric properties of the forces indicated and finds his determinant by the use of the triangle, the parallelogram, the polygon and the square.

THE PARALLELOGRAM

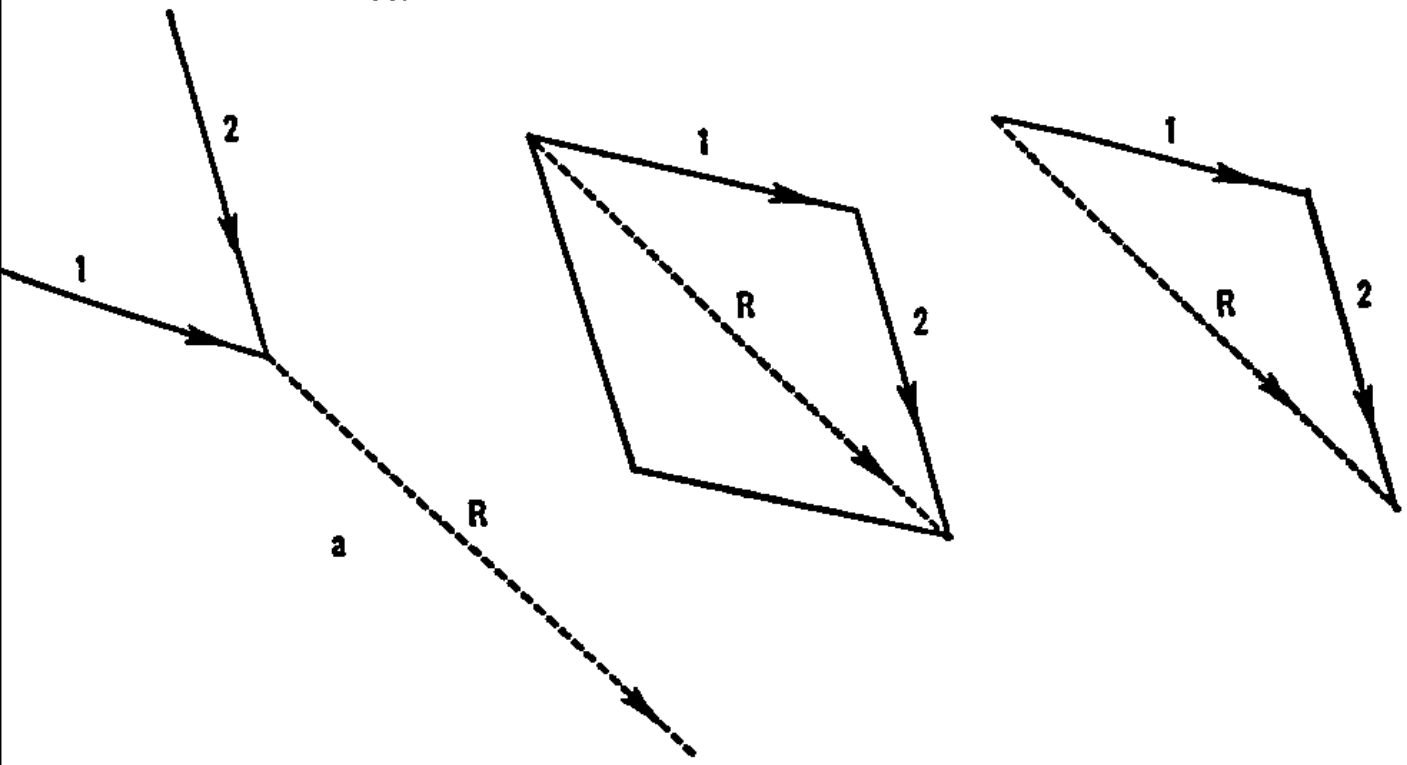


Fig. 60

Parallelogram Law—If two vector quantities, acting at a point, are represented in magnitude and direction by two sides of a parallelogram drawn from a point, then their resultant is represented in magnitude and direction by the diagonal of the parallelogram drawn from the same point (Fig. 60).

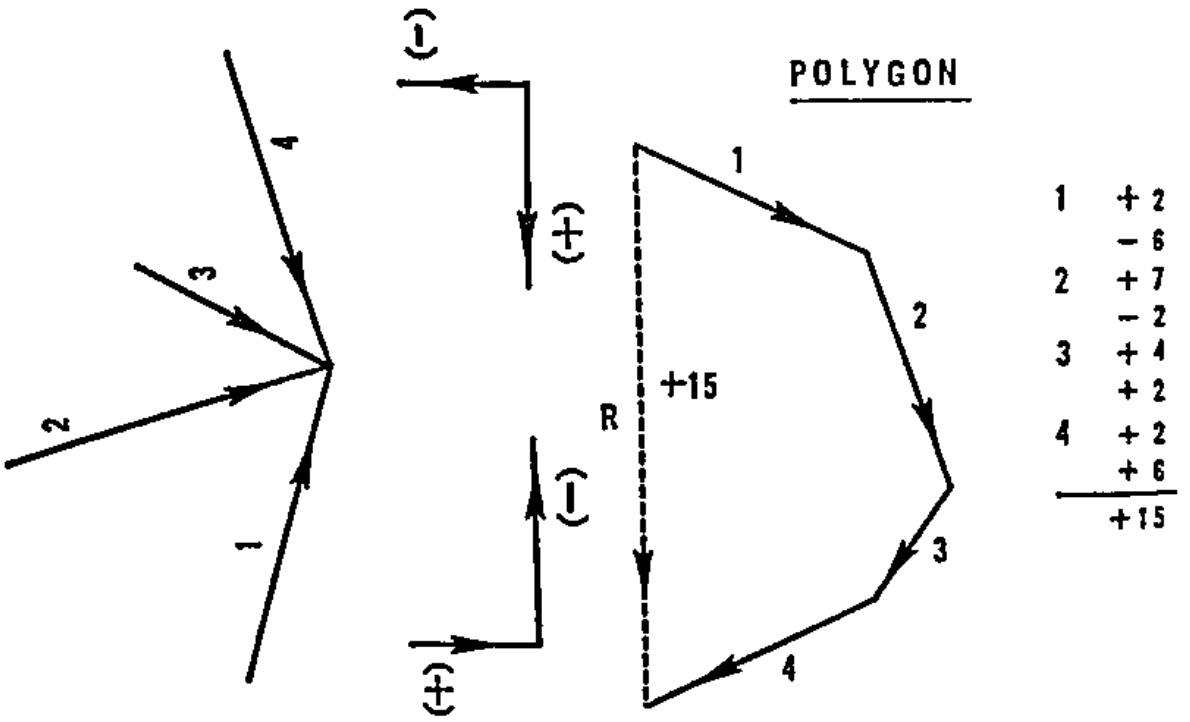


Fig 61

Polygon Law—When more than two vector quantities act at a point, each is represented by a magnitude and direction drawn from tail to head, the next line starting at the head of the first line representing the magnitude and direction. This process is continued till the last vector quantity is completed, then a line is drawn from the tail of the first magnitude to the head of the last magnitude showing the resultant magnitude (Fig. 61).

DDITION BY PARALLELOGRAMS

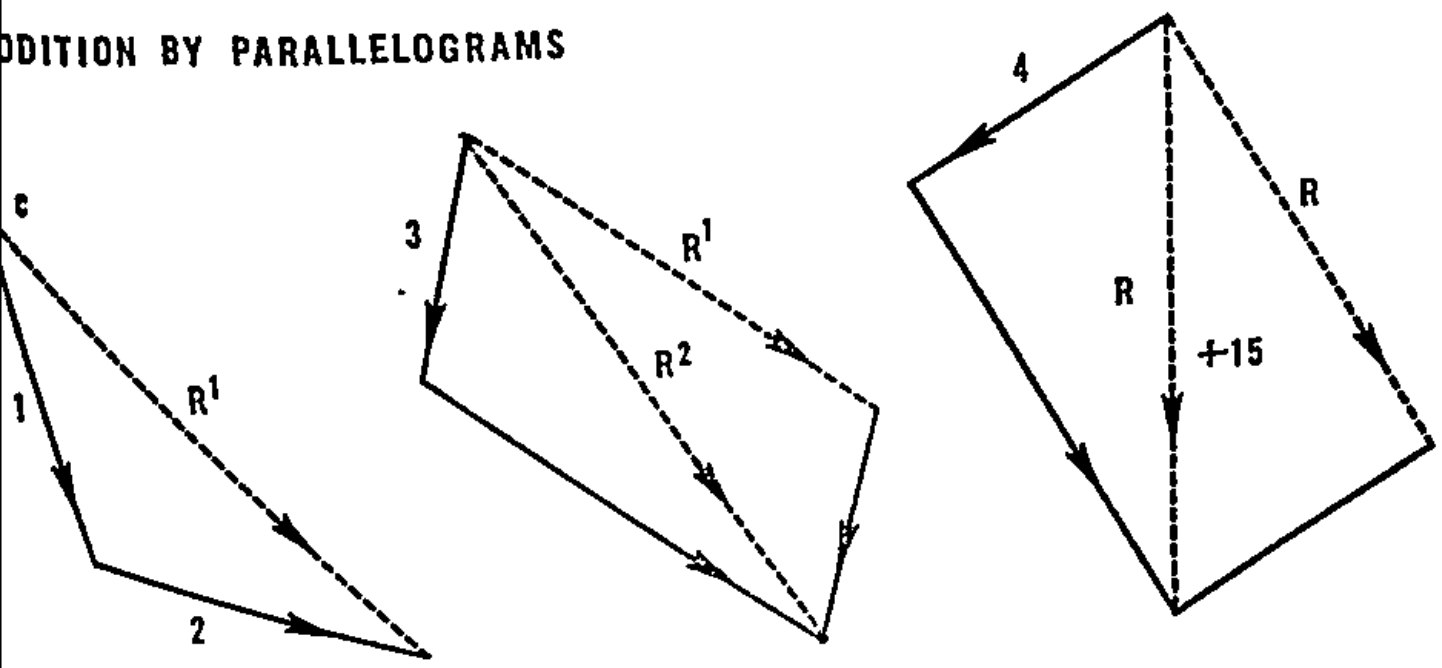
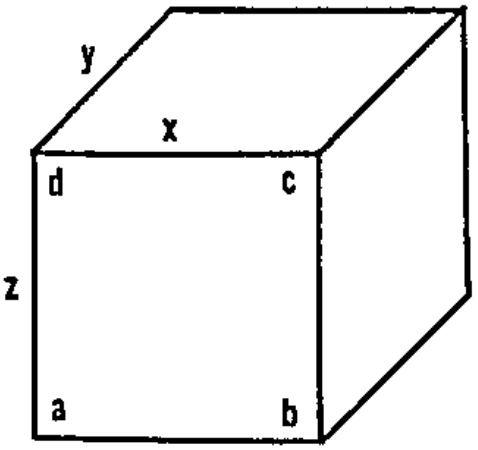


Fig. 62

Addition by parallelograms—When vector quantities act in three or more directions, the first and second magnitudes and directions are drawn and their diagonal recorded. Then the magnitude and direction of the diagonal and the third magnitude and direction are drawn and their diagonal recorded. Then this magnitude and direction and the fourth magnitude and direction are drawn and their diagonal recorded giving the final resultant (Fig. 62).

This may serve as a clue to the creation of the axes of the elements in the atomic charts. The length of the lines indicate the increase in weight of the new element depending upon the weight and direction of the axes of the combining elements.



SQUARE CUBE

$$x \times x = \text{Area}$$

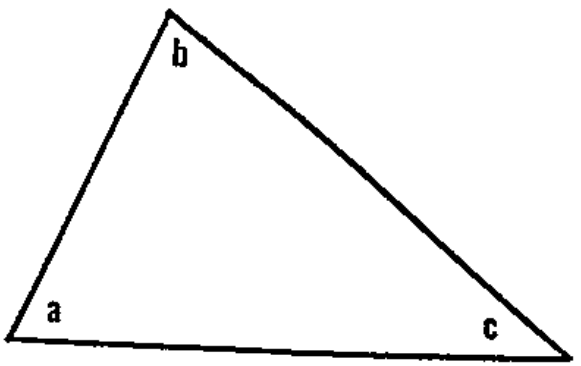
$$x \times y \times z = \text{Cube}$$

$$a = 90°$$

$$a + b + c + d = 360°$$

Fig. 63

Squares and rectangles—The areas of squares and rectangles are obtained by multiplying two sides together. This applies only when the angles are 90° angles. If any one of the angles is larger or smaller than 90°, then the multiplication sign has to be qualified in some manner. The same rule applies to the cubes of squares and rectangles where the three dimensions are multiplied together (Fig. 63).

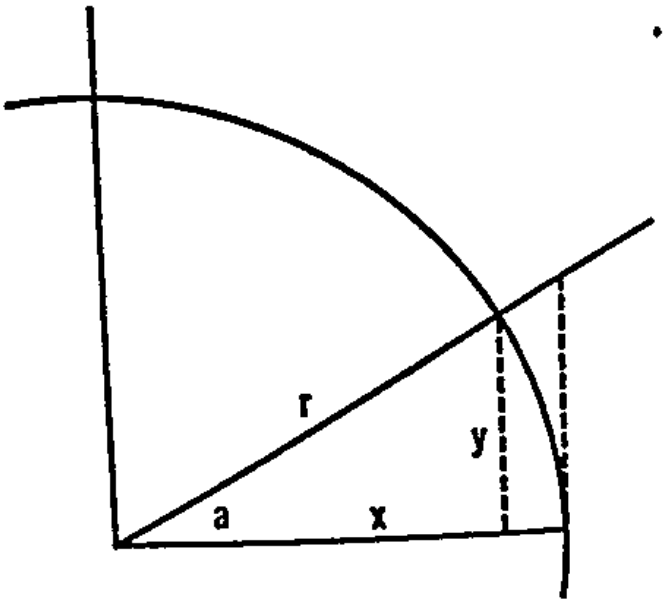


TRIANGLE

$$a + b + c = 180°$$

Fig. 64

Triangles—Every triangle has six parts—three angles and three sides. When any three of these parts are given, provided one of them is a side, the other parts may be obtained (Fig. 64).



RIGHT ANGLE TRIANGLE

Sine a = y/r

Cosine a = x/r

Tangent a = y/x

Cotangent a = x/y

Secant a = r/x

Cosecant a = r/y

Fig. 65

In a right angle triangle, the square of the hypotenuse equals the sum of the squares of the two sides, or the square of one side may be obtained by subtracting the square of the known side from the square of the hypotenuse.

In all right angle triangles having the same acute angle, the sides have to each other the same ratio. These ratios have special names as follows:

Sine—the quotient of the opposite side divided by the hypotenuse.

Tangent—the quotient of the opposite side divided by the adjacent side.

Secant—the quotient of the hypotenuse divided by the adjacent side.

Cosine, cotangent and cosecant—are respectively the sine, tangent and secant of the complement of that angle (Fig. 65).

Mathematics is the transposing of our thoughts into a language of direction where the "plus," "minus," "multiplication" and "division" symbols are used to indicate either a joining together or separation in certain directions. The signs which we use are merely pictographic or phonetic symbols indicating a

joining together or separating, the plus usually indicating a joining together in a straight line or group; the minus, a separation; multiplication indicating a joining together in a straight line or at right angles; division indicating a separation in a straight line or at right angles. When we were taught to use these signs no mention of direction was made until we came to geometry, where the symbols for direction have to be specifically stated. It is interesting to note here that the multiplication symbol and division symbol for quantities or forces functioning in a straight line, or at right angles, are the same, but if some other angle is indicated, other than the straight line or 90 degree angle, then the direction has to be indicated in some manner.

Because of this, mathematical scientists have been able to solve certain problems which the empirical scientists could not solve, because the mathematical scientist can indicate the direction of a force through the use of his signs, whether it be in a straight line, curved, or at right angles, whereas the empirical scientist often is unable to determine directions.

Energy and matter are now considered interconvertible, the connection being expressed in the equation ($e=mc^2$), in which (e) is the symbol for energy, (m) the symbol for mass, and (c^2) the symbol for the velocity of light. Transposing this into the language of direction we have (e=m x c x c), with the multiplication signs supplying the necessary orthogonality, which, even though omitted, have to be implied to give meaning to the equation.

It just so happens that in order to get a satisfactory equation for energy, for some reason the (c) has to be multiplied by itself, so (c^2) does the trick. Many reasons have been given to justify the use of (c^2), the main one being that it seems to supply the right answer. As has been previously stated, no form of energy can exist without the orthoganality supplied through the use of either designated or implied mathematical signs. The extra (c) and multiplication sign have to be there to make the equation, as well as the form of energy, real.

So what the equation really means is that (e) is made up of the three orthogonal forms of motion, with (m) representing the force of gravity, functioning on an axis of centripetal vibration, multiplied by the velocity of light, functioning on an axis of centrifugal rotation, perpendicular to the axis of centripetal vibration, then multiplied by a second velocity of light function ing on a precessed axis of translation or stabilization, depending upon the form of (e) created, this axis of precession being orthogonal both to the axis of vibration and the axis of rotation It is the multiplication signs, either used or implied, which supply the orthogonality so necessary for a true picture of energy

The following equation for the creation of energy was recently introduced in a class in physics,

$$e = m/r^2\ (-c^2)$$

where (e) represents the creation of energy, (m) the mass, (r^2) the force of gravity multiplied by itself, and (c^2) the velocity of light multiplied by itself

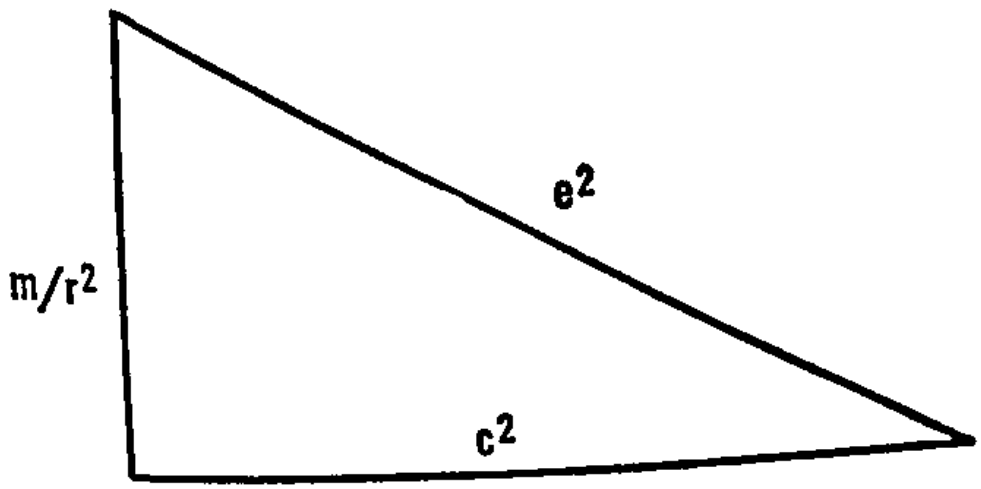


Fig 66

This looks similar to the equation for finding the hypotenuse of a right triangle (Fig 66), except that for a right angle triangle the (e) would have to be (e^2), and a (+) sign would replace the implied multiplication sign) *

THE CREATION OF ENERGY

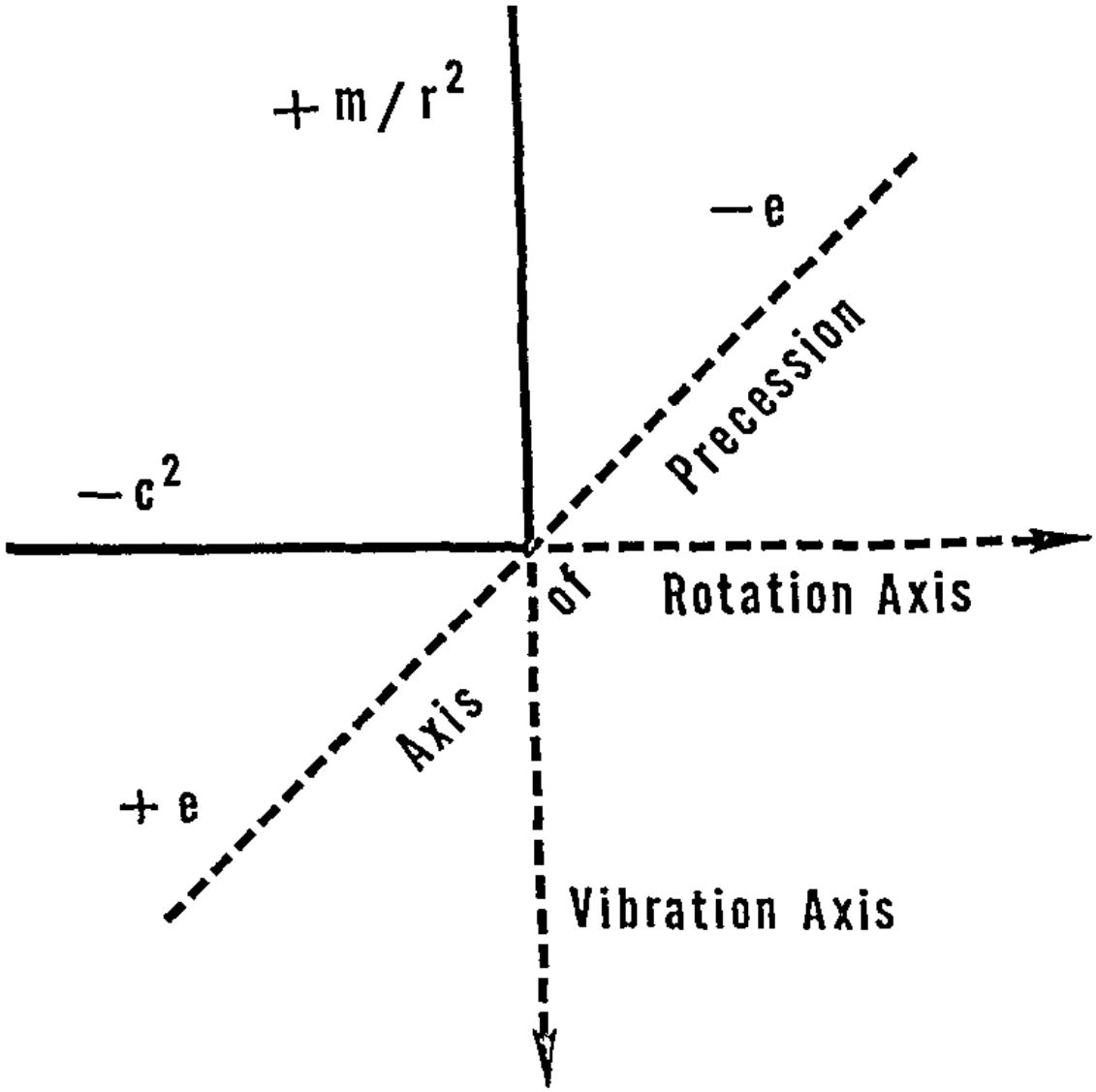


Fig. 67

In figuring the creation of energy (Fig. 67), the directions of the complementary forces are indicated by the mathematical *signs; the* $(+m/r^2)$, *being indicated where the sign is omitted,* to indicate the inward force of gravity; while the $(-c^2)$ indicates the outward force of light and heat. The resultant energy is represented by the (+e) to indicate a new form of energy precessed inward; while the (—e) indicates a form of radiant energy precessed outward.

This equation could be used for the creation* of energy from the ignition of hydrogen and oxygen where the (+e) indicates the creation of water; and the (−e) represents the light shot out from the flame.

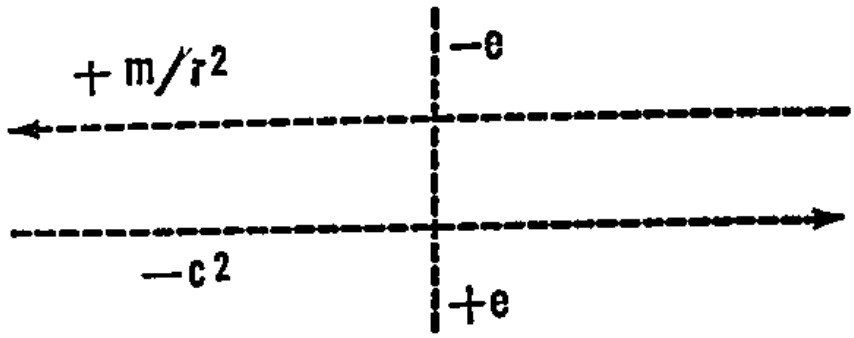


Fig. 68

There is another form of creative energy in which the components that unite, instead of being perpendicular, are parallel to each other.

$$e = (m/r^2) + (-c^2)$$

In this equation the components are added instead of being multiplied. This is the form of energy which we term growth.*

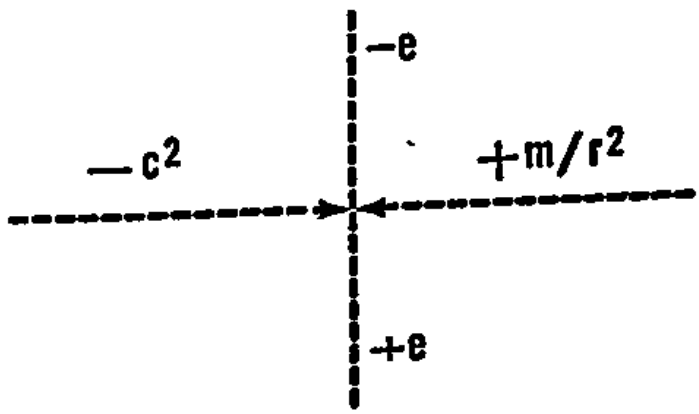


Fig. 69

There is still another form of creative energy in which the components, instead of being perpendicular, or parallel, are inverse, the one positive, the other negative, in which case the one would be divided by the other, the resultant, being precessed to

the perpendicular to create a new and different form of energy. This is termed evolution.*

$$e = (m/r^2) \div (-c^2)$$

In mechanical energy, as demonstrated in Chapter II, the directions of the co-ordinates are clearly demonstrated, but in chemical and atomic energy, where the directions of the axes of the co-ordinators are so infinitesimal that they can not be determined, the factor of direction is apt to be overlooked, but it always has to be indicated in the signs used for formulating any equation for energy.

* THE MATHEMATICAL SYMBOL FOR CREATION IS THE MULTIPLICATION SIGN (X); WHILE THE SYMBOL FOR GROWTH IS THE PLUS SIGN (+); AND THE SYMBOL FOR EVOLUTION IS THE DIVISION SIGN (÷).

CHARTS

CHART NO. I

THE ELEMENTS

SERIES I GROUP I

No	Element	Abr	Wt	Valence	Characteristics
1	Hydrogen	H	1 0078	Univalent	Colorless Tasteless Gas, Water H_2O
2	Helium	He	4 002	Monatomic	Colorless Inert Gas
3	Lithium	Li	6 940		Soft Alkali Metal, Lightest Metal Found in Plants
4	Beryllium	Be	9 02	Bivalent	Hard Metal
5	Boron	B	10 82	Trivalent	Extremely Hard Crystals
6	Carbon	C	12	Quadrivalent	Diamonds, Combines Readily CO_2 in Air
7	Nitrogen	N	14 008	Tri , Quinque	Colorless, Odorless, Tasteless Gas In living tissue 79% of Air Combines at High temperatures
8	Oxygen	O	16	Bivalent	Colorless, Oderless, Tasteless Gas Active at low temperatures 20% of Air Liquid strongly magnetic Water H_2O
9	Fluorine	F	19		Pungent Corrosive Gas In mineral waters and bones

SERIES I GROUP II

10	Neon	Ne	20 18		Colorless, Odorless, Inert Gas Air 02
11	Sodium	Na	22 997		Soft Alkali Metal Found in Plants
12	Magnesium	Mg	24 32	Bivalent	Metal Found in seeds and bones
13	Aluminum	Al	36 97	Trivalent	Silver White Metal Resists Oxidation 08% of Earth's Crust
14	Silicon	Si	28 06	Quadri	Non Metallic Used in Glass and Steel
15	Phosphorus	P	31 02	Trivalent	Non Metalic Poison Found in Bone
16	Sulphur	S	32 06	2, 3, 4, 6	Non Metalic Found in Living Tissue
17	Chlorine	Cl	35 457	Univalent	Heavy Irritating Gas Used for Cleaning
18	Argon	Ar	39 94	Monatomic	Colorless, Odorless, Inert Gas Used in Electric Light Bulbs 01% of Air

Series I Group V

No	Element	Abr	Wt	Valence	Characteristics
37	Rubidium	Rb	85 45		Soft White Meal Alkali Ignites in air Decomposes water violently
38	Strontium	Sr	87 63	Bivalent	Soft Alkaline Earth Metal
39	Yttrium	Yt	88 93	Trivalent	Rare Earth Metal
40	Zirconium	Zr	91 22	Quadrivalent	Black and White Powder
41	Columbium	Cb	93 5	Pentavalent	Metallic
42	Molybdinium	Mo	96	2, 3, 4, 5, 6	Like Iron
43	Masurium	Ma	?		?
44	Ruthenium	Ru	101 7		Hard like Platinum Insoluble Infusible
45	Rhodium	Rh	102 9	Bi Tri	Hard Brittle Metal

Series I Group VI

46	Palladium	Pd	106 7	Bi Quadri	*Hard Brittle Metal Occludes Gas*
47	Silver	Ag	107 88	Univalent	Highest Thermal & Electric Conductivity
48	Cadmium	Cd	112 41	Bivalent	White Metal Dental Work Poison
49	Indium	In	114 8		Soft White Metal
50	Tin	Sn	118 7	Bi Quadri	Soft Malleable Metal
51	Antimony	Sb	121 76	Tri Penta	Crystal Looks Metallic
52	Tellurium	Te	(127 5)		Crystal Like Sulphur Electric Rectifier
53	Iodine	I	(126 93)		Crystal
54	Xenon	Xe	130 2		Inert Gas

Series I Group VII

No	Element	Abr	Wt	Valence	Characteristics	
55	Cesium	Cs	132 81		Soft Silver White Metal Electro Positive	
56	Barium	Ba	137 36	Bivalent		
57	Lanthanum	La	138 9	Trivalent		
58	Cerium	Ce	140 13	Trivalent	Like Iron	Rare Earth Axides
59	Praseodymium	Pr	140 92	Trivalent	Corrodes Readily	Rare Earth Axides
60	Neodymium	Nd	144 27	Trivalent	Yellow	Rare Earth Axides
61	Illinium	Il	?	Trivalent		Rare Earth Axides
62	Samarium	Sm	150 83	Trivalent	Pale Grey	Rare Earth Axides
63	Europium	Eu	152	Trivalent		Rare Earth Axides

Series I Group VIII

64	Gadolinium	Gd	157 3	Trivalent		Rare Earth Axides
65	Tellurium	Te	159 2	Trivalent		Rare Earth Axides
66	Dysprosium	Dy	162 46	Trivalent	Very Magnetic	Rare Earth Axides
67	Holmium	Ho	163 5	Trivalent	Pale Yellow	Rare Earth Axides
68	Erbium	Er	167 64	Trivalent	Red	Rare Earth Axides
69	Thullium	Tu	169 4	Trivalent		Rare Earth Axides
70	Ytterbium	Yb	173 5	Trivalent	Dark Grey	Rare Earth Axides
71	Lutecium	Lu	175			Rare Earth Axides
72	Hafnium	Hf	178 6	Quadrivalent	Black and White Powder Like Zerconium	

Series I Group IX

No	Element	Abr	Wt	Valence	Characteristics
73	Tantalum	Ta	181 5	Pentavalent	Hard Metal Like Tungsten Resists Acid
74	Tungsten	W	184	4, 5, 6	Hard Ductile Metal High Melting Point
75	Rhenium	Re	188 7		Very Hard Metal Least Fusible Non Magnetic
76	Osmium	Os	190 9	2, 3, 4, 6, 8	Very Hard Metal Used for Pen Tips
77	Iridium	Ir	193 1	Bi Tri	Hard Metal
78	Platinum	Pt	195 23	Bi Quadri	Hard Metal Electric Resistant Fuses Poorly
79	Gold	Au	197 2	Uni Tri	Most Malleable and Ductile Metal
80	Mercury	Hg	200 61	Uni Bivalent	Metal Low Melting Point
81	Thallium	Tl	204 39	Uni Trivalent	Aluminum Family Mirrors

CHART NO II

THE RADIO ACTIVE ELEMENTS

SERIES II GROUP I

No	Name	Abr	Wt	Valence	Characteristics
82	Lead	Pb	207 21	Bi Quad	Malleable, Inelastic, Isotope B82 From Radium 88, Actinium 89, Thorium 90
83	Bismuth	Bi	209	Trivalent	Brittle, Poor Heat Conductor, Isotope C83 From Radium 88, Actinium 89, Thorium 90
84	Polonium	Po	210		Resembles Radium, Isotope F84 from Radium, A84 from Actinium and Thorium
85	Astatine	At	211		Radio Active
86	Radon	Rn	222		Radio Active, Isotopic, Resembles Argon
87	Francium	Fa	223		Radio Active
88	Radium	Ra	226 1		Gives off Alpha, Beta, Gamma Rays Maintains High Temperature Disintegrates into Radon 86, Radium A84, B82, C83, C 84, D82, E83, F84, G82—Isotope of Lead
89	Actinium	Ac	227 1		Resembles Lanthanium 57, A, B, G Rays Disintegrates into Radio Actinium 90, X88, Actinin 89, Actinium A84, B82, C83, C'', D81, Isotope of Lead 82
90	Thorium	Th	232 1		Resembles Zirconium 40, A, B, G Rays Disintegrates into Mesothorium 1 88, 2 89, Radiothorium 90, Thorium X88, Thoron 86, Thorium A84, B92, C83, C'84, Isotope of Lead 82

Series II Group II

No	Name	Abr	Wt	Characteristics
91	Protoactinium	Pa	231	Radio Active
92	Uranium	U	238 1	Radio Active, Gives off A, B, G Rays Disintegrates into X,90, X,91 1192, Ionium 90, Radium 88
93	Neptunium	Np	239	Radio Active
94	Plutonium	Pu	239	Radio Active
95	Americium	Am	241	Radio Active
96	Curium	Cm	242	Radio-Active
97			?	
98				
99				

CHART NO III

THE ELEMENTS AND THEIR ASSOCIATION WITH LIVING MATTER

SERIES I GROUP I

	Characteristics	Place in life
1 Hydrogen	Lightest element known, Water H_2O	Essential to life
2 Helium	Inert Gas	
3 Lithium	Lightest metal known Resembles Sodium (11)	Found in all plants and living tissues
4 Beryllium	Hard metal	Found in living tissues
5 Boron	Extremely hard metal	Abundant in plant life and living tissue
6 Carbon	Hardest substance known C_2O in air	Nourishment for plant life
7 Nitrogen	79% of air	Nourishment for plant life Found in all fertilizers
8 Oxygen	20% of air	Supports life
9 Fluorine	Chlorine family (17)	In mineral waters and bones

Series I Group II

		Characteristics	Place in life
10	Neon	Inert Gas, 002% of atmosphere	Used to precess Argon with Potassium
11	Sodium	Alkali, Fertilizer	Abundant in all living tissues
12	Magnesium	Oxidizes in air, reacts violently in water	In plants and bones Fertilizers
13	Aluminum	Alkali, 08% of Earth's crust	In plants and living tissues
14	Silicon	Non metallic, Found in soil	In plants and living tissues
15	Phosphorus	Poison	In plants and living tissues
16	Sulphur	Non metallic	In all living tissue Used in medicine, laxatives Fertilizer
17	Chlorine	Heavy irritating gas Cleaning fluid	Found in all living tissues Fertilizer
18	Argon	Inert gas, 01% of air No known compounds Believed to be monatomic	Combines with Neon to create Potassium

Series I Group III

		Characteristics	*Place in life*
19	Potassium	Alkali, Fertilizer Electro conductivity affected by light Used in photo-electric cells Reacts violently in water	Fertilizer
20	Calcium	Soft metal	In most drinking water Essential constituent of bodies of most plants and animals
21	Scandium	Resembles rare earths	
22	Titanium	Resembles Silicon (14)	Found in some forms of plant life
23	Vanadium	Resembles Nitrogen (7) Phosphorus (15)	Found in plants and living tissues
24	Chromium	Adds toughness & strength Resists acids, corrosion	Found in plants and living tissues
25	Manganese	Not magnetic	Abundant in all living tissue
26	Iron	Strongly magnetic, ductile 05% earth's crust	Abundant in all living tissue
27	Cobalt	Very magnetic Resembles nickel	Abundant in all living tissue

Series I Group IV

	Characteristics	*Place in life*
28 Nickel	Hard, Malleable, Ductile Resists oxidation	Found in some plants and living tissues
29 Copper	Good conductor of heat and electricity, Malleable Very tenacious	Abundant in plants and living tissues
30 Zinc	Most electro-negative metal Acid and basic properties Malleable, ductile	Abundant in plants and living tissues
31 Gallium	Low melting point 85 5 Fuses at 76 F remains liquid	Found in some plants and fish
32 Germanium	Resembles carbon (6) Silicon (14), Tin (50)	Found in spinach
33 Arsenic	Poison, Medicine	Found in plants and living tissues Absorbed in blood, Habit forming
34 Selenium	Affected by light Resistance increased by heat and darkness Resembles Sulphur (16), Tellurium (81)	Found in most plants and living tissues
35 Bromine	Halogen, Disinfectant	Found in most plants and living tissues
36 Krypton	Inert gas No compounds known Resembles Helium (2), Argon (18)	Used to precess Nickel into Rubidium

Series I Group V

		Characteristics	Place in life
37	Rubidium	Alkali, Ignites in air Decomposes violently in water Resembles Potassium (19), Cesium (55)	Found in most plants and living tissues
38	Strontium	Alkali, ductile, malleable Resembles Calcium (20)	Found in most plants and living tissues
39	Yttrium	Resembles Rare earths	
40	Zirconium	Both basic and acidic properties	
41	Columbium	Resembles Tantalum (73)	
42	Molybdenum	Resembles Iron (26), Chromium (24) Strengthens steel	Found in *most plants and living tissues*
43	Masurium	Little known	
44	Ruthenium	Insoluble, infusible One of 7 precious metals, Palladium (46) Rhenium (75), Osmium (76), Iridium (77), Platinum (78), Gold (79)	
45	Rhodium	Difficult to fuse, Platinum group	

Series I Group VI

		Characteristics	Place in life
46	Palladium	Platinum group, Occludes gases	Used in medicines
47	Silver	Sensitive to light Highest thermal and electric conductivity	Found in some plants and living tissues
48	Cadmium	Increases strength and durability and increases fusibility of metals	Found in some plants and living tissues
49	Indium	Resembles Aluminum (13), Gallium (31)	
50	Tin	Not oxidized by air Fair conductor of heat and electricity	Used in medicine
51	Antimony	Resembles Nitrogen (7), Phosphorus (15), Arsenic (33), Bismuth (83)	
52	Tellurium	Non metallic, electric rectifiers Resembles Sulphur (16), Selenium (34)	Found in all plants and living tissues
53	Iodine	Halogen, used in photography Resembles Chlorine (17), Bromine (35)	
54	Zenon	Inert gas, some in air	

Series I Group VII

		Characteristics	Place in life
55	Cesium	Most electro-positive element Resembles Potassium (19), Rubidium (37)	Found in wheat
56	Barium	Alkali earth, decomposes water Resembles Calcium (20), Strontium (38)	Found in living tissues
57	Lanthanum	Rare Earth, Resembles Cerium (58)	Found sparingly in living tissues
58	Cerium	Rare Earth, most abundant Resembles Iron (26)	Found sparingly in living tissues
59	Praseodymium	Rare Earth	Found sparingly in living tissues
60	Neodymium	Rare Earth	Found sparingly in living tissues
61.	Illinium	Rare Earth	Found sparingly in living tissues
62	Samarium	Rare Earth, Resembles Yttrium (39), Cerium (58)	Found sparingly in living tissues
63	Europium	Little known	Found sparingly in living tissues

Series I Group VIII

		Characteristics	Place in life
64	Gadolinium	Rare Earth	Found sparingly in living tissues
65	Terbium	Rare Earth, resembles Yttrium (39)	Found sparingly in living tissues
66	Dysprosium	Rare Earth, most magnetic substance	Found sparingly in living tissues
67	Holmium	Rare Earth	Found sparingly in living tissues
68	Erbium	Rare Earth	Found sparingly in living tissues
69	Thallium	Rare Earth	Found sparingly in living tissues
70	Ytterbium	Rare Earth	Found sparingly in living tissues
71	Lutecium	Rare Earth	Found sparingly in living tissues
72	Hafnium	Rare Earth, Resembles Zirconium (40)	Found sparingly in living tissues

Series I Group IX

	Characteristics	Place in life
73. Tantalum	Vanadium family (23) Resembles Tungsten (74) Acid resistant	
74. Tungsten	Highest melting point 6098 F	
75. Rhenium	Least Fusible, Resembles Magnesium (25)	
76. Osmium	Insoluble in acids, Heaviest substance known	
77. Iridium	Heavy metal	
78. Platinum	Fuses with difficulty Slightly soluble, High electric resistance	Found in plant life
79. Gold	Non-corrosive, Unaltered by heat Yields to alkalis and Nitrates	Found in most plants and living tissues
80. Mercury	Fair conductor, Freezes at —39 67F Molecule monatomic	Found in most plants and living tissues
81. Thallium	Aluminum family (13) Resembles Lead (82) Poison	Found in most plants and living tissues

CHART NO. IV

THE ELEMENTS THAT SUSTAIN LIFE

Groups	Atomic Numbers	Isotopes	1. Prevalent	2. Fertilizers	3. Common in Foods	4. Less Common	5. Less Common	6. Less Common	7. Less Common	8. Precious Metals	9. Inert Gases	10. Insolubles	Unknown
Series I	1.	3.	Hydrogen—water H_2O								Helium		
	2.	2.											
	3.	2.				Lithium							
	4.	3.										Beryllium	
1.	5.	2.				Boron							
	6.	3.	Carbon—in air CO_2										
	7.	2.	Nitrogen—78% air										
	8.	3.	Oxygen—20% air, water H_2O										
	9.	1.				Fluorine							
	10.	4.									Neon—air .02%		
	11.	4.			Sodium								
	12.	3.			Magnesium								
	13.	1.			Aluminum .08% earth's crust								
2.	14.	3.			Silicon—in soil								
	15.	1.			Phosphorus								
	16.	5.			Sulphur								
	17.	3.			Chlorine								
	18.	2.									Argon—air .01%		

	19.	5.	Potassium
	20.	3	Calcium
	21.	1.	Scandium
	22	2.	Titanium
	23.	1.	Vanadium
3.	24.	4.	Chromium
	25.	1	Magnesium
	26	2.	Iron
	27.	1.	Cobalt
	28.	3.	Nickel
	29.	2.	Copper
	30.	7.	Zinc
	31.	2.	Gallium
	32.	8	Germanium
4.	33.	1.	Arsenic
	34.	8.	Selenium
	35.	2.	Bromine
	36.	6	Krypton
	37.	2	Rubidium
	38	3.	Strontium
	39.	3.	Yttrium
	40.	4.	Zirconium
5.	41.	0.	Columbium
	42.	7.	Molybdenium
	43.	0.	Masurium
	44.	7.	Ruthenium
	45.	0	Rhodium

			1	2	3	4	5	6	7	8	9	10
	46	0							Palladium			
	47	2			Silver							
	48	6					Cadmium					
	49	1						Indium				
6	50	11									Tin	
	51	2					Antimony					
	52	8						Tellurium				
	53	1			Iodine							
	54	9								Xenon		
	55	1			Caesium							
	56	4		Barium								
	57	1				Lanthanium						
	58	2				Cerium						
7	59	1				Praeseodymium						
	60	4				Neodymium						
	61	0				Illinium						
	62	0				Samarium						
	63	0				Europium						
	64	0				Gadolinium						
	65	0				Terbium						
	66	0				Dysprosium						
	67	0				Holmium						
8	68	2				Erbium						
	69	0				Thallium						
	70	0				Ytterbium						
	71	0				Lutecium						
	72	0									Hafnium	

			1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
											Tantalum	
	73.	0.						Tungston				
	74.	4.							Rhenium			
	75.	2.							Osmium			
	76.	6.							Indium			
9.	77.	0.							Platinum			
	78.	0.							Gold			
	79.	0.									Mercury	
	80.	9.						Thallium				
	81.	8.										
Series II Radio-Active												
	82.	16.		Lead								
	83.	14.					Bismuth					
	84.	0.						Polonium				
	85.	0.										Astatine
1.	86.	3.										Radon
	87.	0.										Francium
	88.	4.				Radium						
	89.	4.										Actinium
	90.	8.				Thorium						
	91.	0						Protactinium				
	92.	8.				Uranium						
	93.											
	94.											
2.	95.	?										
	96.											

CHART NO V

RADIO ACTIVE ELEMENTS

Series II Group I

SERIES I	SERIES II	GROUP I	*Place in life*
1 Hydrogen	82 Lead	Malleable, Inelastic	Found in plants and living tissue
2 Helium	23 Bismuth	Brittle Poor heat conductor	Astringent
3 Lithium	84 Polonium	Resembles radium	
4 Beryllium	85 Astatine	Radio active	
5 Boron	86 Radon	Radio active, Isotopic Resembles Argon	
6 Carbon	87 Francium	Radio-active	
7 Nitrogen	88 Radium	Gives off A, B, G, rays Maintains high temperatures	Curative Powers
8 Oxygen	89 Actinium	Resembles Lanthanium 57 A, B, G, Rays	
9 Fluoeine	90 Thorium	Resembles Zirconium (40) A, B, G, Rays	
SERIES I	SERIES II	GROUP II	
10 Neon	91 Protactinium	Radio-active	Some found in living tissues
11 Sodium	92 Uranium	Radio-active A, B, G, Rays	Found in plants and living tissue
12 Magnesium	93 Neptunium	Radio-active	
13 Aluminum	94 Plutonium	Radio-active	
14 Silicon	95 Americium	Radio active	
15 Phosphorus	96 Curium	Radio-active	
16 Sulphur	97 ?		
17 Chlorine	98 ?		
18 Argon	99 ?		

SERIES I	SERIES II	GROUP III
	Characteristics	FORMS OF LIFE
Old Number	*New Number*	
19 Potassium	100 Sensitive to light	Alkali
20 Calcium	101 Essential constituent body tissue	LOWEST FORMS OF PLANT LIFE
21 Scandium	102 Similar to Rare-earths	
22 Titanium	103 Similar to Silicon (14)	
23 Vanadium	104 Strengthener, binder	VEGETATION IN GENERAL
24 Chromium	105 Resists corrosion	
25 Manganese	106 Abundant in living tissue	
26 Iron	107 Abundant in living tissue, Magnetic	HIGHER FORMS OF PLANT LIFE
27 Cobalt	108 Strengthener, binder, very magnetic	Acidic

SERIES I	SERIES II	GROUP IV
		Alkali
28 Nickel	109 Hard, resists oxidation	FRUITS & VEGETABLES
29 Copper	110 Very tenacious, good conductor	
30 Zinc	111 Electro-negative	
31 Gallium	112 Hard, low melting point 86F	
32 Germanium	113 Hard, resembles Carbon	HARD WOODS, TREES
33 Arsenic	114 Corrective, used in medicine	
	Absorbed in blood	
34 Selenium	115 Good conductor, sensitive to light	FRUITS & VEGETABLES
35 Bromium	116 Used in medicine, low melting point 19F	FERNS & MOSSES
36 Krypton	117 1/1,000,000 part of air	Acidic

GROUP V

FORMS OF LIFE

SERIES I	SERIES II	
	Characteristics	
Old Number	*New Number*	
37 Rubidium	118 Sensitive to air & water, Low Melting Point 100 4F	Alkali
38 Strontium	119 Essential to living tissue	Invertebrates
39 Yttrium	120 Resembles rare earths	
40 Zirconium	121 Both basic and acidic	Roving and sea life
41 Columbium	122 Acid resistant	
42 Molybdenum	123 Strengthener, binder, high melting point 4595F	
43 Masurium	124 Little known	Shell life
44 Ruthenium	125 Precious metal, insoluble, infusible	Acidic
45 Rhodium	126 Quite infusible, resembles platinum	

GROUP VI

SERIES I	SERIES II	
		Alkali
46 Palladium	127 Occludes gases, precious metal	Vertebrates
47 Silver	128 Sensitive to light	
48 Cadmium	129 Strengthener, light increases sensibility	
49 Indium	130 Low melting point 311F	Mammals
50 Tin	131 Good conductor, oxidizes slowly	
51 Antimony	132 Corrective, used in medicine	
52 Tellurium	133 Sense rectifier	
53 Iodine	134 Sensitive to light, used in medicine	Vertebrates
	Low melting point 113 5F	Acidic
54 Zenon		

SERIES I	SERIES II	GROUP V
	Characteristics	FORMS OF LIFE
Old Number	*New Number*	
37 Rubidium	118 Sensitive to air & water, Low Melting Point 100 4F	Alkali
38 Strontium	119 Essential to living tissue	INVERTEBRATES
39 Yttrium	120 Resembles rare earths	
40 Zirconium	121 Both basic and acidic	ROVING AND SEA LIFE
41 Columbium	122 Acid resistant	
42 Molybdenum	123 Strengthener, binder, high melting point 4595F	
43 Masurium	124 Little known	SHELL LIFE
44 Futhenium	125 Precious metal, insoluble, infusible	Acidic
45 Rhodium	126 Quite infusible, resembles platinum	

SERIES I	SERIES II	GROUP VI
		Alkali
46 Palladium	127 Occludes gases precious metal	VERTEBRATES
47 Silver	128 Sensitive to light	
48 Cadmium	129 Strengthener, light increases sensibility	
49 Indium	130 Low melting point 311F	MAMMALS
50 Tin	131 Good conductor, oxidizes slowly	
51 Antimony	132 Corrective, used in medicine	
52 Tellurium	133 Sense rectifier	
53 Iodine	134 Sensitive to light, used in medicine	VERTEBRATES
	Low melting point 113 5F	Acidic
54 Zenon		

SERIES I	SERIES II	GROUP III
	Characteristics	FORMS OF LIFE
Old Number	*New Number*	
19 Potassium	100 Sensitive to light	Alkali
20 Calcium	101 Essential constituent body tissue	LOWEST FORMS OF PLANT LIFE
21 Scandium	102 Similar to Rare-earths	
22 Titanium	103 Similar to Silicon (14)	
23 Vanadium	104 Strengthener, binder	VEGETATION IN GENERAL
24 Chromium	105 Resists corrosion	
25 Manganese	106 Abundant in living tissue	
26 Iron	107 Abundant in living tissue, Magnetic	HIGHER FORMS OF PLANT LIFE
27 Cobalt	108 Strengthener, binder, very magnetic	Acidic

SERIES I	SERIES II	GROUP IV
		Alkali
28 Nickel	109 Hard, resists oxidation	FRUITS & VEGETABLES
29 Copper	110 Very tenacious, good conductor	
30 Zinc	111 Electro negative	
31 Gallium	112 Hard, low melting point 86F	
32 Germanium	113 Hard, resembles Carbon	HARD WOODS, TREES
33 Arsenic	114 Corrective, used in medicine	
	Absorbed in blood	
34 Selenium	115 Good conductor, sensitive to light	FRUITS & VEGETABLES
35 Bromium	116 Used in medicine, low melting point 19F	FERNS & MOSSES
36 Krypton	117 1/1,000,000 part of air	Acidic

GROUP IX

SERIES I

SERIES II

FORMS OF LIFE

Old Number

Characteristics

73. Tantalum
74. Tungsten
75. Rhenium

154. Acid resistant, retains sensitivity
155. Retains sensitivity, highest melting point
156. Precious metal, least fusible, non-magnetic

HUMAN LIFE

76. Osmium
77. Iridium
78. Platinum

157. Precious metal, insoluble
158. Precious metal, very hard
159. Precious metal, retains sensitivity

THE HUMAN MIND.

THE HUMAN BODY.

79. Gold
80. Mercury
81. Thallium

160. Precious metal, Non corrosive
161. Fair conductor, medicine
162. Resembles lead (82)

GROUP I

SERIES III

163.
164.
165.

166.
167. Spiritual life here on earth, possibly
168.

169.
170.
171.

GROUP VII

FORMS OF LIFE

SERIES I	SERIES II	
	Characteristics	
Old Number	*New Number*	
55 Cesium	136 Most electro positive, low melting point 78 F	
56 Barium	137 Essential to living tissue, decomposes water	
57 Lanthanium	138 Rare-earth	
58 Cerium	139 Rare-earth, resembles iron	MONKEYS
59 Praseodymium	140 Rare-earth, corrodes easily	
60 Neodymium	141 Rare-earth	
61 Illinium	142 Rare-earth	
62 Samarium	143 Rare earth	
63 Europium	144 Rare earth	

GROUP VIII

SERIES I	SERIES II	
64 Cadolinium	145 Rare-earth	
65 Terbium	146 Rare earth	
66 Dysprosium	147 Rare-earth	
67 Holmium	148 Rare-earth	APES
68 Erbium	149 Rare-earth	
69 Thallium	150 Rare-earth	
70 Ytterbium	151 Rare-earth	
71 Latecium	152 Rare-earth	
72 Hafnium	153 Rare-earth, basic, acidic, like zirconium	

REFERENCES

PHYSICS

Foundations of Modern Physics—Thomas B. Brown
The Evolution of Modern Physics—C. T. Chase
Text Book on the Principles of Physics—Alfred Daniell
The World View of Physics—C. F. V. Weizsacker
Classical and Modern Physics—Harvey E. White
The Structure and Properties of Matter—Herman T. Briscoe
The Modern Theory of Solids—Frederick Seitz
Mechanical Vibrations—William T. Thompson
The Particles of Modern Physics—J. D. Stranathan

ATOMIC PHYSICS

The Nature of the Atom—G. K. T. Conn
The Wave Nature of the Electron—G. K. T. Conn
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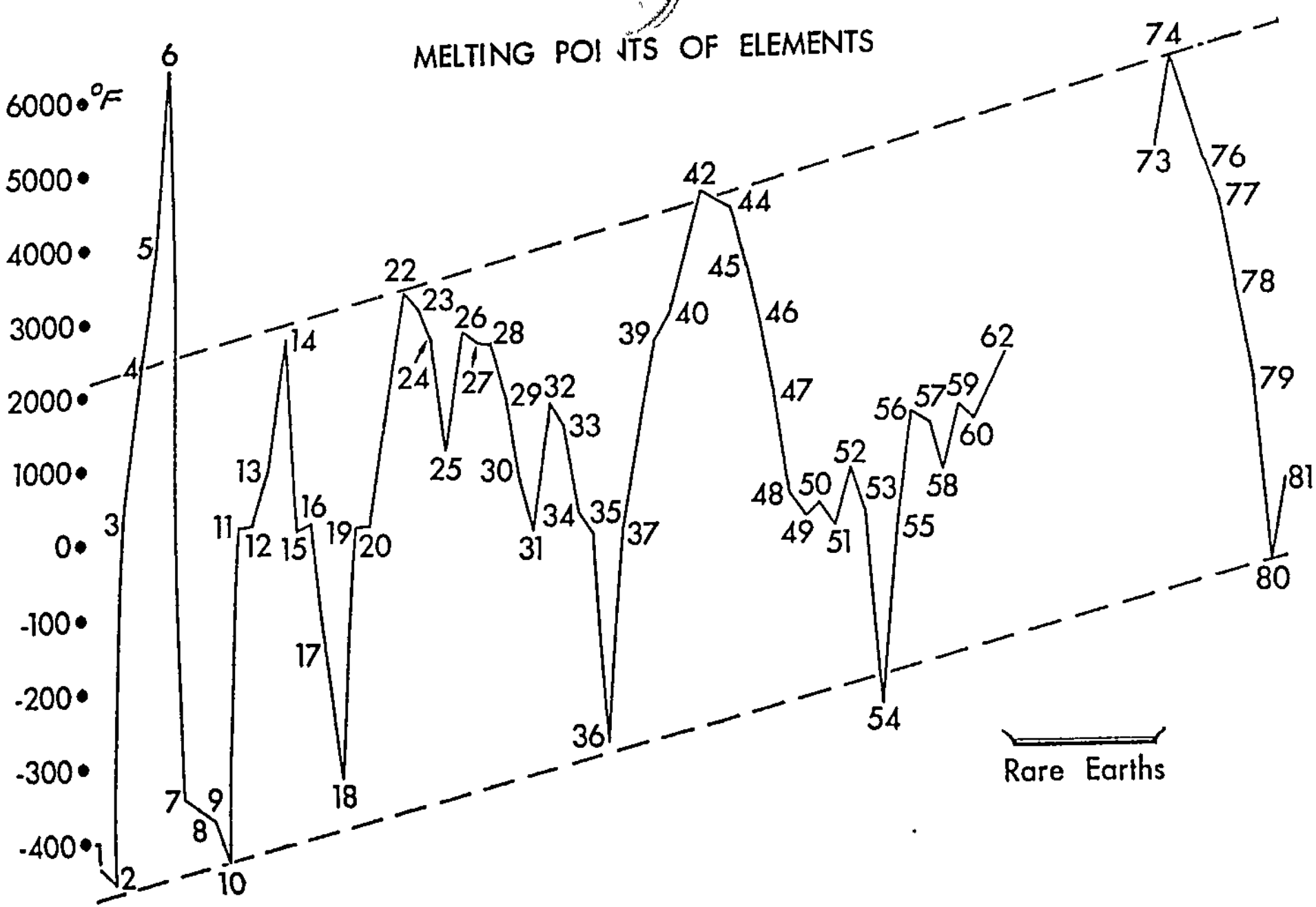
MELTING POINTS OF ELEMENTS
6000 °F
5000
4000
3000
2000
1000
0
-100
-200
-300
-400
Rare Earths

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